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ABSTRACT

This report presents existing workforce levels, training programs and career potentials and develops staffing level projections (1976-1982) based on available information for the State of Kentucky. The study concerns itself with the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, wastewater, and energy. The format includes workforce profiles, projections, growth and career options for each of the areas investigated. Additional sections of the report outline state legislation and selected post secondary institutions with formal Environmental/Energy programs. A state profile and summary is included for cross-reference. The selected bibliography is appended in the Region IV report. This document is one in a series of 69 which presents information for each of the states, Washington, D.C., Puerto Rico, and the Virgin Islands, and national and regional summaries. (CS)

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A National Environmental/Energy Workforce Assessment

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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NATIONAL ENVIRONMENTAL/ENERGY

WORKFORCE ASSESSMENT

for

KENTUCKY

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

Under Grant from:

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010

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PREFACE

This report presents existing workforce levels, training programs, and career potentials and develops staffing level projections (1976-1981) based upon available information for the Commonwealth of Kentucky in the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, waste water, and energy. This study was carried out for the United States Environmental Protection Agency by National Field Research Center of Iowa City, Iowa.

The information and data presented in this report were compiled in large part from extensive interviews with professionals working in the respective areas and were supplemented by telephone surveys and research.

FOREWORD

The material herein contains the information and data collected for eight individual pollution control inventories conducted for Kentucky. The format includes workforce profiles, projections, growth and career potential for each of the areas investigated. Growth projections are necessarily best professional estimates developed from available information and represent what are felt to be realistic figures by experts in the respective areas. The pollution areas considered by this study are as follows:

Air

Noise

Pesticides

Potable Water

Radiation

Solid Waste

Waste Water

Energy

National Environmental Energy
Workforce Assessment

Phase I

KENTUCKY

State Summary

I. AIR

The Kentucky Department for Natural Resources and Environmental Protection is responsible for the commonwealth's air pollution control program. The Department's Division of Air Pollution Control has 126 authorized positions, 111 of which are filled. The professional staff is composed of engineers, air pollution investigators and environmental control inspectors. By 1982, the Division plans to recruit between 35 to 45 persons to increase its total staff to 168.

Kentucky has one local air pollution agency, the Air Pollution Control District of Jefferson County in Louisville. This office employs 39 persons, chiefly engineers and technicians. Agency officials do not anticipate any personnel growth by 1982.

Program officials estimate that there are over 1,000 persons employed by both the public and private sectors to abate air pollution in Kentucky. This includes the estimated one person for each of the state's 774 major installations employed for air pollution control on either a full- or part-time basis. Commonwealth officials anticipate that the private sector will need to recruit additional air pollution control personnel in the next five years.

Approximately eighty percent of the positions projected to be recruited by the Division of Air Pollution Control are environmental specialists, environmental control inspectors (a technician position) and environmental engineers. Also, more technicians may be recruited in the next five years if the Division begins a motor vehicle inspection and maintenance program.

II. NOISE

The Department for Natural Resources and Environmental Protection is authorized to develop and maintain a comprehensive program of state noise regulation. Regulations have not yet been adopted, so the state currently has no regulatory authority. Industrial noise has been identified as the state's major noise problem, although a program is envisioned that would provide protection to the public from all sources of excessive environmental noise.

Two professionals in the Department currently work full-time for the environmental noise control program. As a noise program is implemented, personnel in the regional offices of the Division of Air Pollution Control will be utilized on a part-time basis for monitoring and enforcement purposes. The number of persons for full-time noise control activities in the headquarters office is not expected to increase. Within several years after program implementation, Division administrators expect that one full-time noise control person will be placed in each of the six regional offices. The program will probably not require workforces in the local public agencies.

When enforcement begins, industries will find increasing needs for persons with expertise in the field. Demands will be greatest for highly skilled degreed persons with backgrounds in physics, engineering and acoustics. Demands may also increase for architects with expertise in noise baffling techniques.

III. PESTICIDES

Implementation and enforcement of Kentucky's pesticide laws are charged to the Department for Natural Resources and Environmental Protection. Sixteen professionals in the agriculture field work in registration, certification and enforcement. Three scientists work in a pesticide laboratory. The Kentucky Cooperative Extension Service utilizes twelve extension specialists to train commercial applicators, and 120 county agents train private applicators. Ten students are hired during the summer for alfalfa field scouting.

The Department's Pesticide Section estimates that 2,500 commercial applicators will require certification. An additional estimated 1,500 public operators, 10 consultants and 2,000 dealers will require certification. The number of farmers requiring certification is estimated at 125,000.

At least eight to ten additional persons will be added to the Pesticide Section within five years, including inspectors, entomologists and secretaries. The number involved in training of commercial and private applicators is not expected to increase, although the number of alfalfa scouts could quadruple. State sources believe that the pest control workforce in the private sector will remain relatively stable, although shifts between commercial categories may occur. The number of consultants may increase to 50 or 100, and these persons may begin hiring technician-level scouts. The number of private applicators may increase.

IV. POTABLE WATER

The Kentucky Department for Natural Resources and Environmental Protection carries out the state's safe drinking water program. The commonwealth proposes to assume primacy for the Federal Safe Drinking Water Act beginning July 1, 1977. The agency's current potable water staff is 18. The agency anticipates increasing this staff to 43 by 1982 to meet the demands of the Act. Engineers, as well as technical support personnel, will be utilized.

Commonwealth law requires that there must be a certified operator in charge of water treatment plants. There are currently 601 certified operators of treatment plants and 116 operators of distribution systems. However, many plants and systems as yet do not have certified operators. Hence, program officials plan to train and certify a total of 2,124 operators over the next five years: 1,275 plant operators and 849 distribution system operators.

The Department sponsors an annual certification program for water plant and system personnel. Operator training is conducted through one central seminar and eight regional workshops. As enforcement of the certification law continues, there will be a need for expanding educational/training opportunities for operators. At the present time, plants are experiencing difficulty in locating certified/qualified applicants for available positions.

V. RADIATION

The Office of Radiation Control of the Kentucky Department of Health is responsible for the state's radiation protection program. The Office monitors radioactive emissions to the environment, inspects facilities and issues licenses to users of radioactive materials. Inspection and registration of X-ray machines, microwave and laser devices are also carried out. The Office currently employs 22 persons: 9 health and radiation physicists, one chemist, one biologist, four technicians and 7 other personnel. This staffing level may increase to 26 within several years, chiefly for a certification program for radiation producing equipment operators. Additional inspectors, the number yet undetermined, may be required for an intensification of the radiation producing machine regulation program, specifically for non-ionizing radiation sources.

State sources project that the career potential for health physicists will be good during the next five years in the private sector. The number of consultants is increasing, and nuclear reactors are being constructed in the state that will require health physicists on staff.

VI. SOLID WASTE

Solid waste management control functions are assigned to the Kentucky Department for Natural Resources and Environmental Protection. The Department's Division of Solid Waste currently employs 33 people, chiefly engineers and scientists. This Division may be reorganized and will expand in order to carry out the mandates of the Federal Resource Conservation and Recovery Act of 1976. Officials anticipate that within several years, approximately 80 positions will be added to the solid waste program, chiefly professionals such as engineers, geologists, hydrologists, toxicologists and chemists.

There are an estimated 160 landfill operators in the state. There are no specified hazardous waste disposal sites in Kentucky, although the Division is conducting a survey which will supply information for developing a statewide hazardous material program. Resource recovery systems have not been established in the state as this has not proved to be a viable alternative. The number of landfill operators is expected to remain relatively stable. The future of the hazardous waste management workforce will largely be contingent on the type of management program that is developed by the Division.

The Division recognizes a need for upgrading operator skills, and is in the process of forming a program of information and education geared toward landfill operators. Plans have not been completely formulated but needs are being surveyed.

VII. WASTE WATER

The control of water pollution in Kentucky is chiefly carried out at the state level by the Department for Natural Resources and Environmental Protection. The Department anticipates assuming NPDES permitting authority within several years. There are approximately 114 positions budgeted to the water quality program, chiefly engineers and scientists. By 1982, an estimated 33 additional persons will be required, again engineers and scientists for expansion of existing programs and implementation of the NPDES program.

State officials estimate that there are approximately 1,400 certified operators of wastewater treatment plants in the state, with the majority being at the lowest level, Class I. There are an estimated 800 uncertified operators in the state. As enforcement increases and plants become more complex, the number of certified operators is expected to increase dramatically. Approximately 400 new certificates are expected to be issued each year during the next five years. A general upgrading of skills will be required.

The Department takes several approaches in training wastewater treatment plant operators. An annual school is offered, as well as eight four-day courses for Classes II, III and IV, and 25-30 one-day classes annually for Class I operators. This program may be expanded to include on-the-job training. Sources indicate that future training needs can be met if increased personnel and monetary needs are met.

VIII. ENERGY

The Kentucky Department of Energy was established in 1975, and is the state's lead energy agency. A Kentucky Energy Resources Advisory Commission advises the Commissioner of Energy and the Secretary of Development on all phases of the Kentucky energy program. The Department employs 20 persons, including geologists, political scientists, and engineers. The Department will coordinate an energy conservation program under the provisions of the Energy Policy and Conservation Act (EPCA). Various other state agencies will assist in implementing this program. The Department may increase its staffing level to 28 within five years. Increased numbers of personnel will become involved in energy conservation programs in other participating agencies. Highly skilled engineers, architects and scientists will be required in the private sector for meeting the demands of EPCA.

A major portion of Kentucky's energy-related workforce is located within the coal mining industry. Environmental controls have promoted the usage of professionals such as geologists, civil, mining and chemical engineers, reclamation specialists, and chemists to assist in meeting requirements. Field research suggests that demands for these professionals should significantly increase as the use of coal increases and environmental requirements become increasingly stringent. As new technologies become available, such as coal liquifaction and gasification, there will be a demand for highly skilled scientists and engineers.

COMMONWEALTH OF KENTUCKY - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	165	169	184	199	205	207	5%
NOISE[2]	2	2	8	8	8	8	60%
PESTICIDES[3]	163	171	182	190	197	203	4%
POTABLE WATER[4]	735	999	1,265	1,514	1,792	2,067	23%
RADIATION[5]	23	26	26	26	26	26	3%
SOLID WASTE[6]	193	193	250	292	292	292	9%
WASTEWATER[7]	1,500	1,915	2,323	2,732	3,140	3,547	19%
ENERGY[8]	20	22	24	26	28	28	7%
TOTALS	2,801	3,497	4,262	4,987	5,688	6,378	18%

[1]Includes the state and local programs. An estimated 835 persons service the field in the private sector.

[2]Includes state agency. Not included is the private sector. where it is anticipated that needs will increase for experts in the field.

[3]Includes lead agency, State and county extension and alfalfa scouts. Does not include an estimated 2,500 commercial applicators, 1,500 public operators, 10 consultants, 2,000 dealers and 125,000 private applicators. The commercial applicator workforce is expected to remain stable; the number of consultants may increase to 50-100; the number of private applicators may increase.

[4]Includes state personnel (1976=18; 1981=43) and operators of water treatment plants and distribution systems.

[5]Includes the state agency. Additional increases could occur if the non-ionizing program is expanded. Workforce growth may occur in the private sector.

[6]Includes the state agency (1976=33; 1981=83) and the estimated number of landfill operators. Increases may occur for hazardous wastes and resource recovery.

[7]Includes the state agency (1976=100; 1981=147) and certified wastewater treatment plant operators.

[8]Includes the state lead energy agency.

EDUCATION

There are six educational institutions throughout Kentucky that offer environmental curricula which are intended to produce graduates prepared to move directly into environmental careers. The programs offer degrees ranging from the B.S. to Ph.D.

Western Kentucky University in Bowling Green and the University of Louisville offer B.S. degrees in Environmental Engineering. Students explore aspects of pollution and waste disposal as well as engineering problems and related studies. Students in the Louisville program may also qualify for an M.S. degree.

Georgetown College in Georgetown and Western Kentucky University provide B.S. programs in Environmental Science; Morehead University in Morehead offers a B.S. Environmental Studies major with four options, in Ecology, Geology, Social Sciences and Economics and Chemistry and Physics; and Eastern Kentucky University in Richmond presents B.S. programs in Environmental Sciences and Public Health with an Emphasis in Environmental Health.

Civil Engineering degrees are granted on the B.S. and M.S. levels at the University of Louisville and on the B.S., M.S., and Ph.D. levels at the University of Kentucky in Lexington. The latter University also offers an M.S. degree in Nuclear Engineering.

LEGISLATION

The environmental/energy legislation for Kentucky was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Protection Law

Pesticide Use and Application Act of 1972

Garbage and Refuse Disposal Law

Department of Energy Law

Strip Mining Law

National Environmental Energy Workforce Assessment

Phase I

KENTUCKY

State Report

STATE PROFILE

Kentucky was one of the first states to follow the original 13 into the Union when it became the fifteenth state in 1792. Known as the Bluegrass State, Kentucky often brings to mind images of bourbon whiskey, horse racing, and coal mines.

With a population in excess of 3.2 million, the commonwealth ranks twenty-third in this category. Louisville, the largest city in Kentucky, is the home of a major state university and is important for its cigarette and whiskey production. Lexington is the only other city of over 100,000 population and is a major tobacco processor. The capital is located in Frankfort, a relatively small city.

Agriculture continues to dominate the commonwealth's economy as it has for many years. Tobacco, corn, hay and soybeans are major crops. Not surprisingly, Kentucky ranks first nationally in the breeding of thoroughbred saddle horses and race horses. The production of bluegrass, hay, and corn is essential for horse raising and other livestock operations.

Kentucky is second only to West Virginia in coal production. Underground mines and strip mines are both prominent in the commonwealth; with an estimated 33 billion tons of coal still underground, mining is likely to continue as a vital force in the economy. Other mineral resources include petroleum, natural gas, asphalt and iron ores. Major manufactured products include whiskey, cigarettes, furniture, aluminum ware, paints, machinery, and iron and steel products.

Physical features range from the Cumberland and Pine mountain ranges in the east to the lowland areas in the west. The Bluegrass area of Kentucky lies at its geographic and legendary heart. Many coal fields present in the west are stripmined, although much of the area is very fertile and farming is also important to the region. Rivers are a key feature of Kentucky, particularly the Ohio River, which forms the state's northern boundary. The Ohio and Mississippi Rivers, together with various tributaries give Kentucky more miles of navigable streams than any other state.

Kentucky is a state rich in tradition and history, from the legacy of Daniel Boone to the annual running of the Kentucky Derby. The commonwealth is becoming more urban, but its leisurely pace of living and strong family ties remain as part of a southern heritage. A unique blend of the past and present coexist in many areas of life.

Industrial growth in Kentucky has been well above the national average. This industrial expansion, combined with the continued mining of vast eastern coal fields, holds the key to the state's economic future. If coal use becomes more common in Kentucky, air pollution and reclamation of stripmined lands will present two major environmental challenges. A 1966 law began the land restoration and reforestation process, but this and other measures will have to be strengthened to assure the commonwealth's development while conserving its scenic wonders.

KENTUCKY POLLUTION CONTROL AND ABATEMENT AGENCIES

The Kentucky Department for Natural Resources and Environmental Protection is the principal state environmental agency. The Department contains two bureaus: the Bureau of Natural Reosurces and the Bureau of Environmental Protection. The former bureau contains programs in the following areas: forestry, mined area reclamation, conservation, beautification, wild rivers and pesticide control. The Bureau of Environmental Protection contains the air, noise, water quality, solid waste, sanitary engineering and plumbing programs. The radiation control program is located in the Kentucky Department for Human Resources. The Kentucky Department of Energy is the lead energy agency.

The purpose of the air pollution program is to attain and maintain ambient air quality consistent with health and welfare requirements mandated by the federal and state governments by controlling air contaminants present in the outdoor atmosphere. The Department is authorized to prescribe regulations for the prevention, abatement and control of air pollution. Kentucky has one local air pollution control program, the Air Pollution Control District of Jefferson County. The commonwealth's Division of Air Pollution also houses the noise control program. Enabling legislation was passed in 1974, and regulations are being developed.

The goal of the Department's potable water program, in the Division of Sanitary Engineering, is to secure compliance for public water supplies in order to assure the continuous supply of acceptable drinking water. The Division ensures that all municipal water supplies, water districts,

fluoridation installations, and interstate carrier water suppliers are properly designed, maintained and promoted. Also carried out is a public swimming pool health program. The Division proposes to assume primary enforcement responsibility under the Safe Drinking Water Act in 1977.

Also in the Department's Bureau of Environmental Protection, the Division of Solid Waste regulates solid waste disposal to protect the environment and citizens from improper solid waste disposal and management by providing inspection, regulations, training, technical assistance, and public education and information. This Division will implement the Federal Resource Conservation and Recovery Act, and will be combined with the Pesticide Section to become the Division of Hazardous Materials and Waste Management.

The Pesticide Section (now in the Division of Special Programs, Bureau of Natural Resources) is responsible for regulation of the sale or use of pesticides. Pesticide registration is carried out, as well as the certification of commercial and private pesticide applicators. The Section contains a laboratory that performs analyses of pesticides for label verification and performs tests on samples such as foods and animal feeds for pesticide residues. The Kentucky Cooperative Extension Service is responsible for training commercial applicators, while private applicators are trained by county agents.

The Division of Water Quality carries out programs under the Federal Water Pollution Control Act, such as the construction grants program, and has applied for NPDES permitting authority. This Division also licenses and trains wastewater treatment plant operators, inspects wastewater facilities and performs stream monitoring and special surveys. The chief

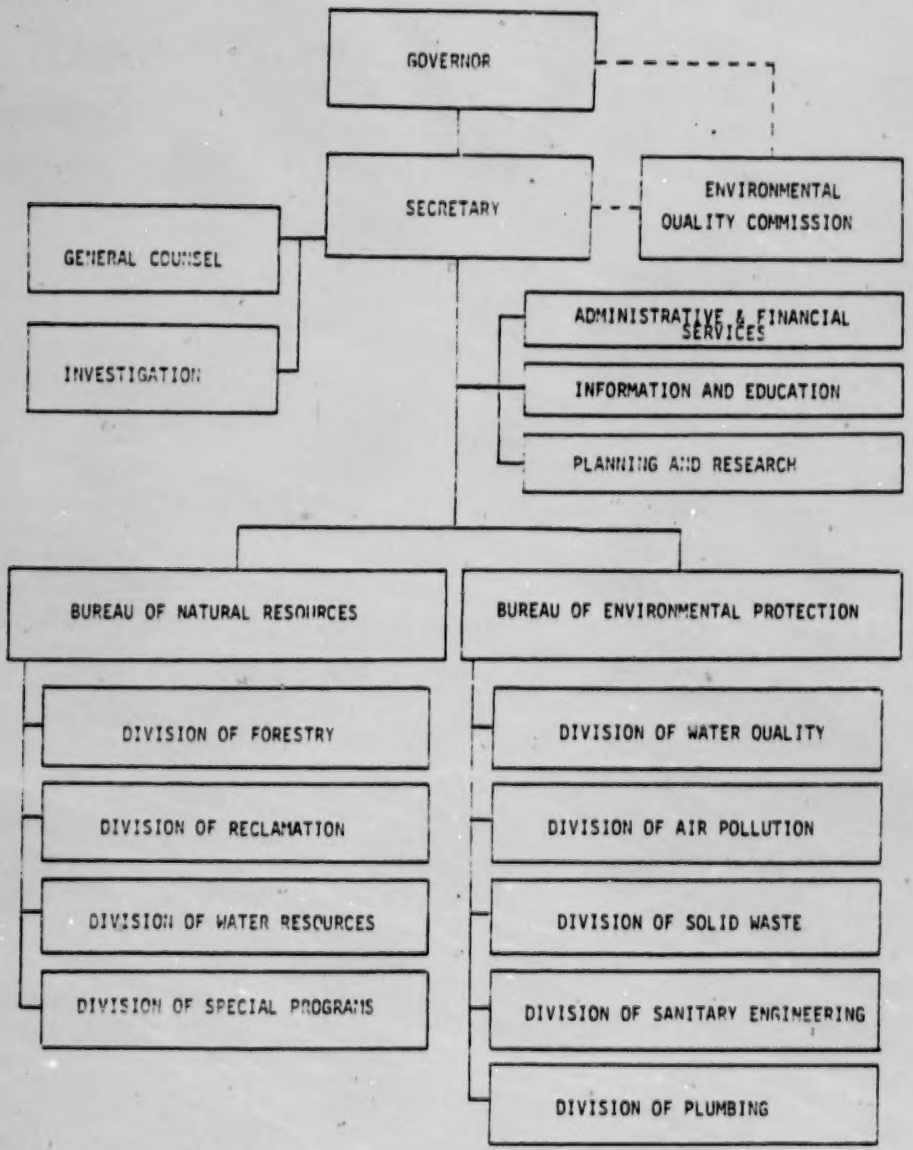
purpose of the Water Quality Program is to safeguard from pollution the uncontaminated waters of the state, to prevent the creation of new pollution, and to abate existing pollution.

The Department of Human Resources' radiation program is located in the Office of Radiation Control of the Bureau for Health Services. This Office monitors facilities that use radioactive materials and licenses users of such materials. X-ray machines, microwave and laser devices and other radiation-emitting machines must also be registered. The Office also plans to implement a program for the certification of radiation producing equipment operators.

The Kentucky Department of Energy was established in 1975. The purposes of this Office include administering programs relating to curtailment, allocation, conservation, planning and management of all forms of energy, formulating energy management and contingency plans, and developing a process for the regulation of energy facilities siting. A program will be administered under the Federal Energy Policy and Conservation Act. A Kentucky Energy Resources Advisory Council advises the Commissioner of Energy and the Secretary of Development on all phases of the Kentucky energy program.

KENTUCKY DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

Figure 1



Pollution Control and Abatement Programs

I. AIR

A. Introduction

Air pollution control and abatement responsibilities in Kentucky are delegated by KRS 224.033 to the Department for Natural Resources and Environmental Protection. The Department is authorized to prescribe regulations for the prevention, abatement and control of air pollution. The Division of Air Pollution Control within the Bureau of Environmental Quality is actually charged with the implementation of the Department's responsibilities. The Division of Air Pollution Control is "...to attain and maintain ambient air quality consistent with health and welfare requirements mandated by the federal and state governments, by controlling air contaminants present in the outdoor atmosphere."

According to the "State Air Pollution Implementation Plan Progress Report, January 1 to June 30, 1976" prepared by the Environmental Protection Agency's Office of Air and Waste Management and the Office of Air Quality Planning and Standards, the New Source Review portion of Kentucky's State Implementation Plan has been approved. Kentucky's entire set of Emission Limitations regulations were approved on May 10, 1976. There are no transportation measures required of Kentucky in its State Implementation Plan. As of June 30, 1976, Kentucky has 859 major installations capable of emitting over 100 tons of pollutants each year. With regard to emission limits and/or compliance schedules, 703 of these installations are in compliance and 156 are in violation.

Between July 1, 1975 and June 30, 1976, Kentucky has conducted 3,749 field investigations and 99 formal written inquiries to determine compliance status of air pollution sources. In terms of case development actions taken by Kentucky between the same time period, 225 notices/citations of violation were issued, 39 administrative orders were issued, and 79 civil/criminal procedings initiated.

The Division has established a list of 22 objectives to be attained during 1976-1978. Major goals include having 700 facilities achieve permit system compliance, issuing 170 construction permits, and providing support personnel for a statewide emission inventory of 1,350 point sources.

Kentucky has only one local air pollution control and abatement program, the Air Pollution Control District of Jefferson County in Louisville. Program guidance is provided by the Air Pollution Control Board of Jefferson County. The Division of Air Pollution Control has six regional offices located in Ashland, Bowling Green, Florence, Hazard, Owensboro, and Paducah.

B. Workforce Profile

The Division of Air Pollution Control currently has a total of 126 authorized positions, 111 of which are filled and 15 of which are vacant. Over 88% of the current authorized positions are filled.

The Division is composed of the administrative section and two branches with roles and responsibilities as follows:

1) Administrative Services--Responsible for the preparation of budgets and grants, the handling of all the division's purchases, the regulation of all personnel activities, the coordination of training and the insurance of effective communication.

2) Compliance Branch--
   a) Enforcement and Surveillance Program--Responsible for conducting field investigations, servicing complaints, observing and reporting violations, preparing evidence for all enforcement actions, and noise control.

   b) Engineering and Permits Program--Responsible for conducting source registrations, reviewing, construction and operations permits, and reviewing indirect source applications.

3) Technical Branch--
   a) Technical Services Program--Responsible for maintaining and operating State Implementation Plan air monitoring stations, performing analyses of air samples, conducting special air monitoring studies, developing sampling methods and procedures, and performing stack testing.

   b) Development and Evaluation Program--Responsible for developing and updating emergency episode plans, formulating control strategies and new regulations, conducting emission inventories, developing emission standards, providing technical assistance, performing meteorological services and dispersion modelling, and preparing EPA's required quarterly and semi-annual reports.

The professional staff of the Division of Air Pollution Control is composed primarily of environmental engineers, environmental specialists, and environmental control inspectors. Environmental specialists must have a Bachelor's Degree in a science-related area and are responsible for enforcing air pollution regulations and making inspections of companies to ensure that they are in compliance or maintaining primary monitoring stations. Environmental control inspectors, who are

technicians, maintain air monitoring stations. The following table depicts the distribution of personnel in the Division of Air Pollution Control.

TABLE I

KENTUCKY DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

Division of Air Pollution Control
Current (1976) Staffing Level

Position	1976
Engineer	32
Scientist	51
Technician	13
Other	30
TOTAL	126

The engineers hold positions as environmental engineers requiring a Bachelor's Degree in engineering. Engineers have been the most difficult to recruit because of competition with industry, other states, and federal government. The scientists are degreed environmental specialists, air pollution investigators, and chemists. Environmental control inspectors, laboratory aides, an engineering helper and an electronic technician, all have technical positions. The "other" category included secretaries, program analysts, and administrators.

The Air Pollution Control District of Jefferson County in Louisville has a staff of 39 persons. The staffing level by occupational category is depicted in the following table.

TABLE II

COMMONWEALTH OF KENTUCKY

Air Pollution Control District of Jefferson County
Current (1976) Staffing Level

Position	1976
Engineer	11
Attorney	1
Scientist	3
Technician	15
Other	9
TOTAL	39

The two scientists are chemists. The technicians employed by the Louisville local air program include seven inspectors. The positions in the "other" category include one manager, a public information specialist, a community planning specialist and five clerks.

Program officials estimate that there are over 1,000 persons employed by both the public and private sector to abate air pollution in Kentucky. This total includes the Division's 125 employees, the Louisville local air program's 39, and the remainder are employed with Kentucky's 859 industrial operations.

C. Workforce Projections

Workforce projections regarding the state and municipal air quality control programs are based on the best professional judgements of administrators of both the Division of Air Pollution Control and the Air Pollution Control District of Jefferson County.

By 1982, the Division plans to recruit between 35 to 45 persons to increase its total staff to 168. Sources in the field project an annual growth rate of eight to ten percent per year over the next five years. Positions included in this estimate are ten environmental engineers, ten environmental control inspectors, eight environmental specialists and ten clerical, administrative and other positions. Additional personnel may be required if the Division obtains new inspection/maintenance of motor vehicle responsibilities to ensure that they conform to anti-pollution regulations. Staffing projections for the next five years for the Division of Air Pollution Control are shown in the table below.

TABLE III

KENTUCKY DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

Division of Air Pollution Control
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	32	32	37	42	46	47	n/a	8%
Scientist	51	52	55	58	60	60	n/a	3%
Technician	13	13	18	23	23	23	n/a	13%
Other	30	33	35	37	37	38	n/a	5%
TOTAL	126	130	145	160	166	168	25%	6%

A 25 percent average annual turnover rate has been experienced among the environmental positions. Young engineers employed by the Division often are recruited by private industry after two-three years of service.

Louisville air programs do not anticipate additional personnel growth by 1982. Existing personnel are likely to be shifted to other responsibilities, e.g., program planning and inspection and maintenance of motor vehicles. Personnel from the Laboratory and the Air Monitoring programs are likely to be shifted to these other responsibilities. The Louisville air program has acquired a telemetry air monitoring system which will enable the Louisville program to reduce the need for technicians to perform surveillance and air monitoring tasks.

D. Training and Certification

The Division of Air Pollution Control conducts quarterly visible emission evaluations for "smoke readers," who must be recertified every six months. Each of the quarterly sessions lasts three to four days and consists of one lecture and two evaluation periods. Between 35 and 50 people attend each session. They represent the Division of Air Pollution Control, the Louisville local air program, and industry. Kentucky and Tennessee send their visible emission evaluation instructors to the other's smoke schools for recertification. This is considered important as it enables the two air programs to achieve some degree of objectivity in conducting these evaluations.

Personnel employed by the Division often attend environmental-related courses offered by local universities or colleges. The Division pays tuition fees to enable its personnel to participate in such training. Staff are also encouraged to attend U.S. Civil Service Commission courses and seminars held by the Air Pollution Control Association.

E. Career Potential

Although the Louisville local air program has completed its growth phase and has stabilized, the Division of Air Pollution Control is still anticipating increasing its workforce. Approximately 80 percent of the positions projected to be recruited by 1982 are environmental specialists, environmental control inspectors and environmental engineers. Also, more technicians may be recruited in the next five years if the Division begins a motor vehicle inspection and maintenance program.

F. Conclusion

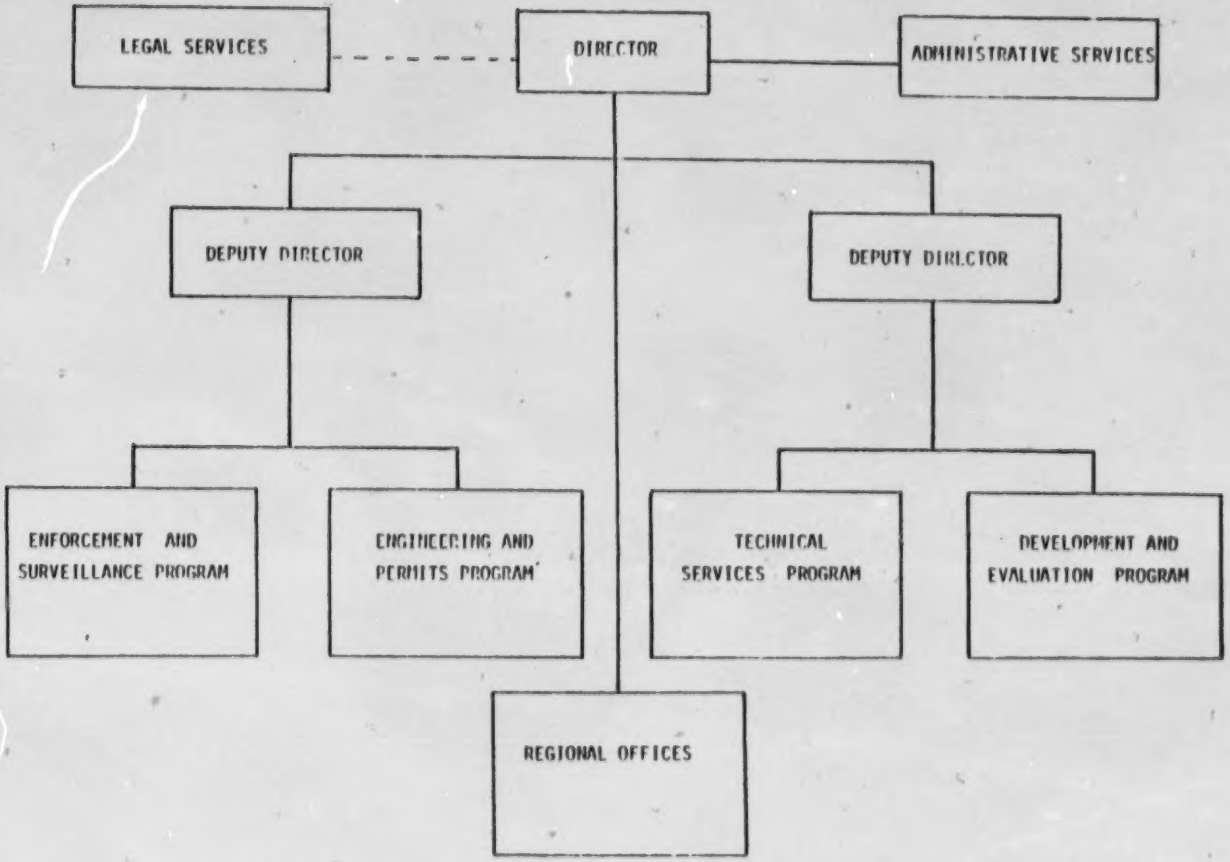
The Kentucky Division of Air Pollution Control is a relatively large organization with a present staff of 126 employees located at the central office in Frankfort and in six regional offices. By 1982, the Division is expected to recruit an additional 35 to 40 persons. Environmental engineers, environmental specialists and environmental control inspectors (a technician position) have the most favorable career potential on the state level in Kentucky.

The Division of Air Pollution Control is an active participant in EPA Air Pollution Training Institute courses at Research Triangle Park, North Carolina. The Institute's tuition requirement and lack of new courses are likely to compel the Division to utilize the Institute less frequently. Division officials are anticipating active recruitment of additional air pollution control personnel in the next five years.

DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

Division of Air Pollution Control

Figure 2



II. NOISE

A. Introduction

Kentucky Revised Statutes (KRS) Chapters 224.710 to 224.800, enacted in 1974, authorizes the Department for Natural Resources and Environmental Protection to develop and maintain a comprehensive program of state noise regulation. The Act specifies that this program may include, but is not limited to the following:

1) Controls on environmental noise through the licensing, regulation, and restriction of the use, operation, and movement of products;

2) Noise emission standards for products;

3) Labeling requirements which prohibit the sale or lease of products without notice regarding noise levels or the effectiveness in reducing noise levels;

4) The development and adoption of ambient noise standards;

5) The development of a plan to achieve ambient noise standards;

6) The development of insulation and abatement standards for buildings;

7) The establishment of noise insulation districts.

The Department is given authority by the Act to certify products, and such products may be purchased by the State Government if costs do not exceed 125% of the retail prices of the least expensive substitute products. Additionally, the law prohibits the modification of motor vehicle exhaust systems that would cause increased noise levels. State sources indicate that this section of the law is not specific enough to allow adequate enforcement, and may be revised to allow the needed control.

A Noise Advisory Committee has been established that provides input and recommendations to the Department regarding the State noise control program. This Committee consists of seven members from private enterprise, State universities, the State Legislature, a labor union and the public at large. This Committee will review noise regulations that have been prepared by the Department and offer recommendations for their approval/disapproval in April of 1977. State sources have identified industrial noise as the major environmental noise problem in the State, although a program is envisioned that would provide protection to the public from all sources of excessive environmental noise. Until regulations are adopted, the State will have no regulatory authority.

B. Workforce Profile

Two professionals in the Department for Natural Resources and Environmental Protection currently work full-time for the environmental noise control program. These persons have science backgrounds with training in the field of noise and acoustics. Until late 1976, the program was housed in the Division of Special Programs of the Department's Bureau of Natural Resources, but has been moved, and is now a part of the Division of Air Pollution Control of the Department's Bureau of Environmental Protection.

At the present time, the noise control staff answers statewide noise complaints, offering advice to gain cooperation from noise sources. These persons offer technical assistance to those in the Division of Air Pollution who develop noise control regulations. The staff also co-sponsors seminars with the University of Kentucky and other institutions of higher learning in the field of noise control.

According to a recent survey, four cities in Kentucky have some type of noise ordinance. The following table depicts the type of ordinance each city has:

TABLE IV

Kentucky Municipal Noise Ordinances

City	Nuisance	Vehicle	Recreational Vehicle	Aircraft	Construction
Covington	X	0	0		0
Lexington	0				
Louisville		X	X	X	X
Newport	0	0			

Key: X - Regulations including acoustical criteria
0 - Regulations not including acoustical criteria

(Chart exerpted from Sound and Vibration, December, 1976, Clifford R. Braddon, Contributing Editor.)

The Louisville and Jefferson County Air Board, in cooperation with Bowman Airfield and the Federal Aviation Administration, has recently developed a comprehensive noise abatement program for the Field in response to complaints from neighbors regarding noise caused by propellor-driven small airplanes. A complete description of this program has been published in Sound and Vibration, February 1977. In this article entitled "Practical Noise Abatement for a General Aviation Airport", the author, William S. Hamilton, indicates that the program has substantially lessened the nuisance/noise impact on surrounding neighborhoods.

Other localities in the State have not developed comprehensive noise programs, and State officials are unaware of any communities that have designated noise control personnel. A local city attorney in Covington has been involved in environmental noise control efforts.

Industries in the State have typically not addressed environmental noise control because of the current lack of State or federal regulation. Those persons in environmental or safety staffs may on occasion address environmental noise as a part of overall job duties.

C. Workforce Projections

As a noise program is implemented, personnel in the regional offices of the Division of Air Pollution Control will be utilized on a part-time basis for monitoring and enforcement purposes. The number of persons for full-time noise control activities in the headquarters office is not expected to increase. Within several years after program implementation, Division administrators expect that one full-time noise control person will be placed in each of the six regional offices. These offices are located in Ashland, Bowling Green, Florence, Hazard, Owensboro, and Paducah.

The implementation of the plan will not significantly affect local noise control workforce levels, according to sources in the field. Earlier plans of the noise control staff provided for training persons in law enforcement agencies of larger cities in noise monitoring and control. Under this plan, the State staff was to loan monitoring equipment to these agencies, that would in turn assist in identifying major noise sources. When the noise control staff was transferred, the new Division changed the approach, and source identification will be carried out strictly at the State level. The exact nature of the noise control plan will to an extent be dependent upon the outcome of source identification surveys, and the nature of the regulations that are adopted.

Based upon input from sources in the field, when adoption and enforcement of regulations take place, industries will find increasing needs for expertise in the field of noise control, in order to stay in compliance.

In some cases, the duties of those persons who deal with inplant noise may be expanded to include environmental noise control, as principles and instrumentation are similar. However, persons with real expertise in any aspect of noise control are in short supply at the present time, and highly skilled personnel in the field of physics, acoustics, engineering and architecture should be in significant demand.

D. Training and Certification

Noise control personnel have been able to attend technical courses and seminars held throughout the country, although the rate of attendance has recently decreased. Two universities in the State offer courses related to noise control. The University of Kentucky offers a program in sound engineering and the University of Louisville offers several basic courses in acoustics.

As field personnel in the Division of Air Pollution Control become involved in the noise program, training will be required to teach these persons monitoring techniques, enforcement requirements and details of the laws and regulations. The noise control staff plans to carry out this training for the field personnel, and specific plans have not been finalized, although tentative plans involve utilization of both classroom and field training.

As mentioned previously, the noise control staff cooperates with several colleges and universities in the State in offering seminars in noise control for industrial staffs. Continuing Education Units are offered to participants, and topics covered include the basics of noise, the effects of noise on humans, the cost of noise control, and the status of state and federal regulations. Speakers who are experts in the appropriate

fields are recruited by the State noise control staff, and each session lasts one day. A total of eight sessions will be held early in 1977, two of which had been held at the time of this report, with approximately fifteen participants at each session.

E. Career Potential

Limited opportunities may appear in the Division of Air Pollution Control for professionals with training in the field of noise. It appears that the greatest workforce needs will be in the private sector for complying with regulations. Demands will be greatest for highly skilled degreed persons with backgrounds in physics, engineering and acoustics. Demands may also increase for architects with expertise in noise baffling techniques.

F. Conclusion

Environmental noise will be controlled by the Department for Natural Resources and Environmental Protection under the authority of KRS Chapter 224. Regulations are currently being prepared. A comprehensive noise control plan is envisioned that would allow for control of unacceptable noise levels from a wide variety of sources.

The full-time noise staff may increase from two to eight within the next five years, and field personnel in the Division of Air Pollution Control will receive noise training in order that they may also provide noise control services on a part-time basis. The greatest workforce impact of the law will be in the private sector, where demands are projected to increase for professionals with expertise in the field. Currently, two state universities offer courses in the field, and seminars are being held for industrial personnel that will assist in providing expertise to industrial personnel.

III. PESTICIDES

A. Introduction

Kentucky Revised Statute (KRS) 249.250 to 249.340, the Kentucky Termite and Pest Control Industry Law, prohibits that anyone engage in the business of or sell advice regarding structural pest control unless licensed by the State. KRS 217B, the Kentucky Use and Application Act, requires that licenses be obtained for pesticide applicators and operators not regulated under the former law, and for pesticide dealers and pest control consultants. Pesticide applicators are those persons that engage in the business of applying pesticides on the lands of another, and operators are employees of applicators that apply pesticides. These laws authorize the State to develop a restricted-use pesticide list, and require that applicators furnish proof of insurance to be eligible for licensing. Certification of private applicators is authorized by Chapter 217B.

An Examining Board is created by the Termite and Pest Control Industry Law which consists of five members from both the public and the private sectors. Chapter 217B authorizes the establishment of a Pesticide Advisory Board to assist in the promulgation of rules and regulations, and to assist in the administration of the Chapter.

The Kentucky Pesticide Control Act of 1974, KRS Chapter 217, requires the registration of pesticides and regulates the distribution and handling of these products. The law is written to allow uniformity with the Federal Insecticide, Funcigide and Rodenticide Act.

Implementation and enforcement of these Acts are charged to the Department for Natural Resources and Environmental Protection. Applicator training is carried out by the Kentucky Cooperative Extension Service. Sources in the Department indicate that KRS Chapters 249,250 to 249.340, which have been in

effect since 1960, at the present time do not meet federal guidelines. State officials are working toward repealing this law and integrating the required authorities and guidelines with KRS 217B.

B. Workforce Profile

Within the Department for Natural Resources and Environmental Protection, pesticide activities are carried out in the Pesticides Section of the Division of Special Programs, Bureau of Natural Resources. For registration, certification and enforcement duties, there are three environmental supervisors, twelve inspectors and one compliance officer. All persons must have bachelor-level degrees in areas such as horticulture and entomology, or have the equivalent job-related experience. Nine persons have bachelor degrees, while four have master's degrees. Duties of field inspectors include the following:

1) To check commercial pesticide applicators to ensure proper licensing and record keeping, and to check new business for licenses;

2) To inspect applicators for proper storage and disposal of chemicals, and to inspect application equipment;

3) To sample pesticides being applied or sample damaged materials and submit to the laboratory for analysis;

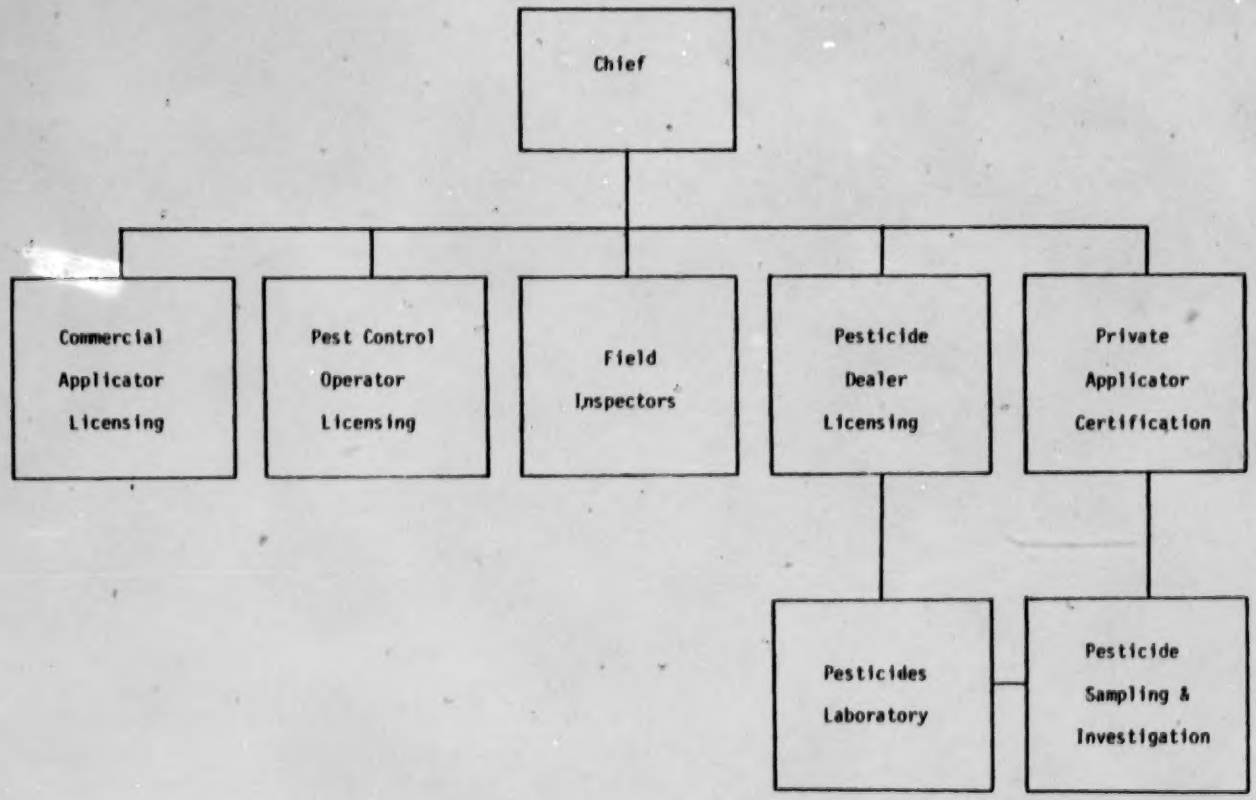
4) To make independent investigations of complaints alleging misuse of pesticides, evaluate damage caused by pesticide misuse, and appear in court as expert witnesses if needed;

5) To give advice to applicators or make independent on-site investigations concerning chemical spills or poisonings and safe storage and/or disposal of pesticides and pesticide containers.

Also, within the Pesticide Section is a laboratory that performs analyses of pesticides for label verification and performs tests on such samples as foods, animal feeds, water and crops for pesticide residues. Two chemists and a supervisor comprise the staff of the laboratory.

Figure 3 KENTUCKY DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

Pesticides Section



All positions are filled through the State Merit System. Sources in the Section indicate that no problem is encountered in locating qualified personnel. For inspectors, the ability to communicate effectively with and relate to the public is considered an important asset.

Within the Kentucky Cooperative Extension Service, twelve extension specialists have been involved with the training of commercial applicators and operators through the development of training materials and the presentation of training sessions. These specialists come from such professional backgrounds as weed science, entomology, plant pathology, agricultural engineering and horticulture. These specialists have trained 120 county agents throughout the State who, in turn, provide training to private applicators. Also within the Cooperative Extension Service, a pilot pest management program is carried out in one area of the State. Ten students from vocational curricula are hired during summer months for scouting alfalfa fields for pests and determining the economic thresholds for pesticide application.

The Pesticides Section estimates that 6,000 persons will have received certification by the end of 1977, including dealers, operators and applicators. Applicators and operators are certified in the following categories:

- Agricultural Pest Control
  - Plant
    - Ground
    - Aerial
  - Animal
- Forest Pest Control
- Ornamental and Turf Pest Control
- Seed-Treatment
- Aquatic Pest Control
- Right-of-Way Pest Control
  - Ground
  - Aerial
- Industrial, Institutional, Structural and Health Related Pest Control
  - Termite
  - General Pest
  - Fumigation
- Public Health Pest Contol
- Regulatory Pest Control
- Demonstration and Research Pest Control
  - County Agents
  - Chemical Salesmen and Representatives
  - Vo-Ag Teachers
- Other
  - University Staff Personnel

Pesticide Section officials further estimate that the following persons will require licensing:

Category:	Number:
Public Operators	1,500
Consultants	10
Dealers	2,000

Public operators are generally persons hired by governmental agencies, housing authorities and other agencies and institutions, that apply pesticides as a portion of overall maintenance duties. This category was created in order to exempt these persons from paying the insurance rates required for commercial applicators.

State officials estimate that as many as 125,000 farmers will become certified. This number is higher than a previous estimate, as officials are finding that several persons per farm are often becoming certified.

The total estimated pesticide and pest control picture is reflected in the following table in which figures are approximations of the workforce engaged in pesticides on either a full- or part-time basis:

TABLE V

Current (1976) Kentucky Pesticides Workforce Staffing Levels for both the Public and the Private Sectors (est.)

Public Sector	1976
Department for Natural Resources & Environmental Protection	21
Cooperative Extension Service	
State Extension	12
County Extension	120
Summer Alfalfa Scouts	10
Private Sector	
Farmers	125,000
Commercial applicators/operators	2,500
Dealers	2,000
Public Operators	1,500
Consultants	10
Total	131,173

C. Workforce Projections

The Pesticides Section plans to hire one, possibly two entomologists within a year to deal with special insect problems in the commonwealth. The additional secretarial assistance is desired to keep up with the typing requirements stemming from the certification process. Officials project that two or more additional field inspectors will be required within the next five years to keep up with increased investigations and enforcement requirements.

At the present time, the laboratory in the Pesticides Section analyzes only those samples collected by its own inspectors. In the future, the laboratory may also perform analyses for sources outside of the Section, such as private industries, educational institutions and the general public. If this expansion of activities takes place, officials indicate that two additional chemists will be required. The Section has entered into a tentative cooperative agreement with EPA to conduct a dual sampling program, whereby samples from the State will be analyzed by the Section and by the EPA pesticides laboratory at Bay St. Louis, Mississippi.

The Division of Solid Waste of the Kentucky Department for Natural Resources and Environmental Protection proposed a reorganizational plan as a result of the Federal RESOURCE Conservation and Recovery Act, whereby the Pesticides Section and the Division of Solid Waste would be combined to form a unit called the Division of Hazardous Materials and Waste Management. The reorganizational plan has been accepted at the Departmental level, has been approved by the Governor, and will become effective June 1, 1977.

Within the Cooperative Extension Service, an increase in number of persons involved in applicator training is not anticipated. The number of temporary alfalfa scouts, however, could quadruple within the next five years,

according to sources, as the geographical scope of this project may increase, and because farmers have been very receptive to the program.

State officials believe that the pest control workforce in the private sector will remain relatively stable during the next five years, although shifts within certain categories may occur. The field is expected to become more specialized for reasons which include requirements for certification and the increasing complexity of chemicals.

The number of ornamental and turf and structural applicators may decline during the next several years, as smaller firms may close due to the competition with large national firms and high insurance rates. Several factors could affect the future number of applicators and operators in the plant agricultural category. Changes in insurance rates could cause increases or decreases in the total number, and farmers may increasingly hire professionals to apply pesticides because of certification requirements, costs and other factors.

The number of pest control consultants is expected to increase to 50 or 100 by 1982, because of the increasing complexity of chemicals, the critical nature of application timing, and increased concern over the proper application of pesticides. State sources believe that these private consultants will in the future employ scouts to assist in determining economic thresholds for pesticide application.

In sum, while the number of applicators is not expected to increase appreciably, the field will become increasingly specialized. There may be a smaller number of pest control companies, but the remaining companies will be quite large.

The number of private applicators will probably remain relatively stable unless homeowners in the future desire certification to apply pesticides to

their property. If homeowners become certified, the number of private applicators could increase dramatically. The likelihood of such development is dependent upon the final form of the federal restricted-use pesticide list.

D. Training and Certification

New entrants to the Pesticides Section spend approximately two weeks traveling with experienced field inspectors. Two to three times per year, staff personnel attend conferences or seminars related to the pesticides field. In addition, salary advancements are offered to those that complete additional college coursework in a related field, although no employees have as yet taken advantage of this opportunity. Section personnel also participate in the applicator training offered by the Cooperative Extension Service.

Training for commercial applicators/operators is held in many locations throughout the State. General standards are covered in three hours, depending upon the category, and lectures are the chief training mode. Tests are administered at the end of these sessions by the Pesticides Section. The manual for the general standards was developed by the Cooperative Extension Service and approved by EPA. The specific standards materials and presentations were also prepared by the Extension Service. By the spring of 1977, approximately 40 sessions had been held and 6,500 operators/applicators trained. Extension sources indicate that sessions will be held at approximately the same rate that has occurred in recent months thorugh the spring 1978. After this time, the rate will necessarily decrease, as most persons desiring certification will have had training by this time. Sessions that are held will probably be similar to those held at the present time.

Training for private applicators is held throughout the State by county agents. The number of sessions held in each county varies with the needs, but often occur three to four times per week. Audio-visual training is given, accompanied by a study of the private applicator training tabloid. Included in the tabloid are self-quizzes with answers, to be used by the applicators to assess their own progress. Following completion of training, a certification of competency statement is signed by the trainer and forwarded to the Pesticides Section. Passage of a written competency test is alternative means of certification. For those unable to read, oral questioning is utilized to verify competence, after being tutored by representatives of the Pesticides Section or the Extension Service. Certification is granted for single products only. After the Winter of 1977-1978, county agents will probably continue to provide this type of training, although if homeowners require certification for pesticide use, a new apprcach may be used, possibly utilizing a televised process.

Extension officials have indicated that the impact of the private and commerical training has been very positive. The expertise of the applicators is being upgraded, substantially, the clientele base has increased, and input from participants has been positive.

E. Career Potential

Within the Pesticides Section, several opportunities are expected to develop for entomologists, inspectors and chemists. Although overall numbers of applicators and operators are not expected to grow, demands are expected to increase for persons with training and expertise in the field of pesticides and pest control. The greatest opportunities appear to be for degreed and highly skilled pest control consultants and for scouts with previous training in the field of pesticides, possibly from two-year curricula.

F. Conclusion

The Kentucky Department for Natural Resources and Environmental Protection is responsible for Kentucky's pesticide regulatory program, while the Cooperative Extension Service carries out applicator training. Limited workforce growth is expected in the Pesticide Section of the Department, and the Section may be combined with the Division of Solid Waste.

Sources believe that applicator training programs are successful in providing applicators with the knowledge required to safely apply pesticides, and major changes in training are not planned for the future.

While the number of applicators is not expected to increase, overall expertise is expected to improve as a result of training requirements. In addition, demands are expected to continually increase in the private sector for degreed and highly skilled pest consultants and and for scouts from two-year pesticide-related curricula.

IV. POTABLE WATER

A. Introduction

The Division of Sanitary Engineering, located within the Department for Natural Resources and Environmental Protection, is the state lead agency of the Kentucky potable water program. The Division has primary responsibility for the Commonwealth's Public Water Supply Program and the Public Swimming Pool Program. The primary goal of the Division is to secure and maintain compliance both for public water supplies and swimming pools in order to assure the continuous supply of acceptable drinking and pool water. The Division ensures that all municipal water supplies, water districts, fluoridation installations, interstate carrier water suppliers and public swimming pools are properly designed, maintained, and promoted.

The Division provides the following services:

1) review for approval plans and specifications for public and semipublic water supplies and public swimming pools;

2) conduct periodic field inspections of public and semipublic water supplies;

3) interpret the chemical and bacteriological results of water samples;

4) perform monthly evaluations of water plant operational reports;

5) provide training/certification of water plant operators.

Support services are provided to the Division central office through six district offices. The district offices are referred to as: the Western District, South Central District, North Central District, Central District, North Eastern District, and South Eastern District. Currently, all the districts are operational.

The Division proposes to assume primary enforcement responsibility under the Safe Drinking Water Act by the end of Federal Fiscal Year 1977. The Division has revised its water supply regulations, developed emergency plans for drinking water supply and is hiring additional personnel for the implementation of the various programs stipulated by the Act.

As defined by the Safe Drinking Water Act, Kentucky has 1,293 public water supply systems. This includes approximately 755 community supplies and 538 non-community supplies. Federal and State regulations make the distinction between community and non-community supplies on the basis of resident or transient usage. A community supply serves year-round residents; the non-community supply serves a user of the supply at least 60 days out of the year.

B. Workforce Profile

The Division of Sanitary Engineering is currently staffed with a total of 18 persons. During 1976, the Division experienced a growth of five positions. These five positions were added in preparation for accepting primacy under the Safe Drinking Water Act. The following table depicts the total staffing level of the Division's central and district offices by occupational type:

DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

BUREAU OF ENVIRONMENTAL PROTECTION

Figure 4

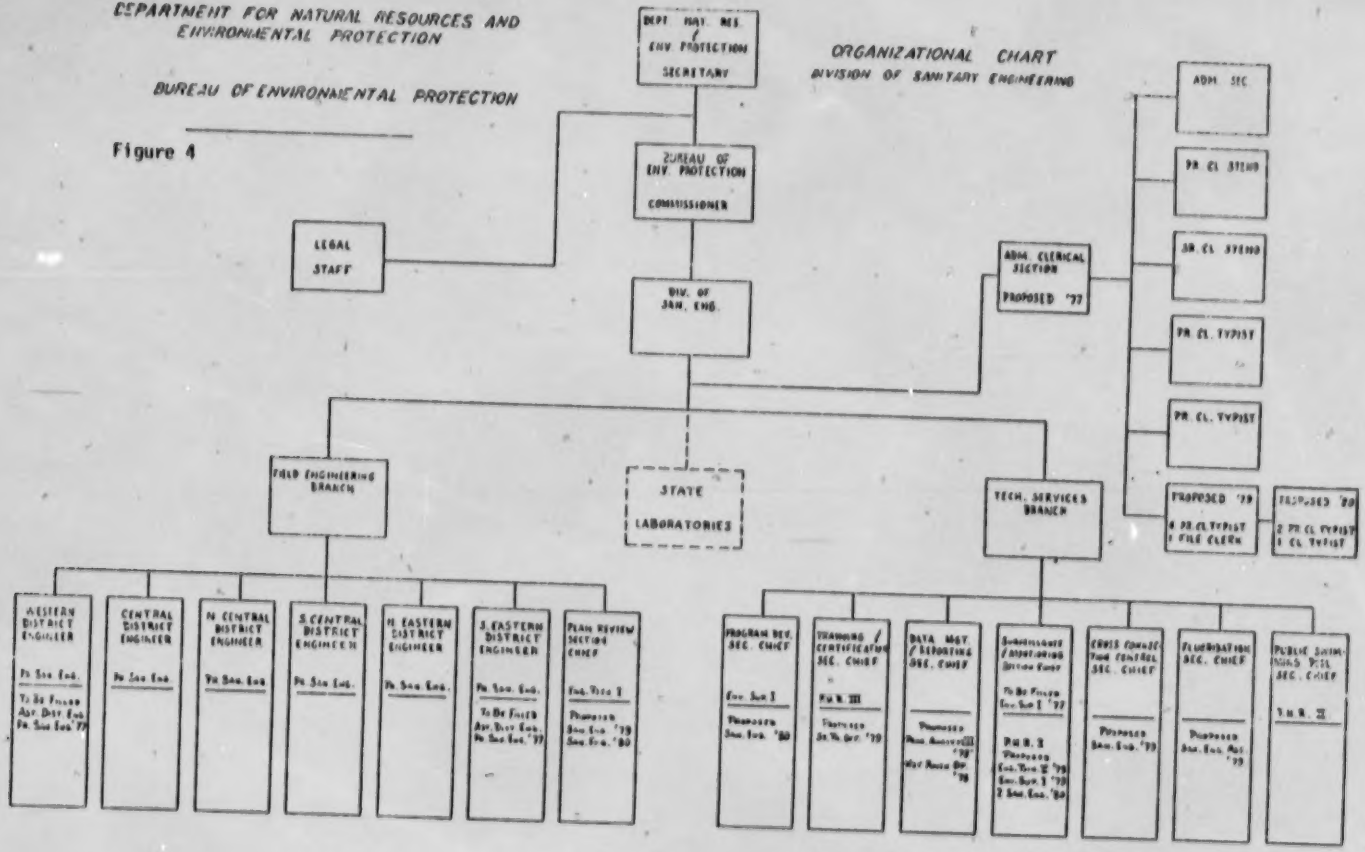


TABLE VI

DEPARTMENT FOR NATURAL RESOURCES
AND ENVIRONMENTAL PROTECTION

Division of Sanitary Engineering

Current (1976) Staffing Level

Position	1976
Engineer	9
Technical Support	4
Other*	5
Total	18

*Includes clerical positions.

Water treatment plants are categorized according to a four point classification system. There are four types of classifications: Class I, Class II, Class III, and Class IV, each relative to the population served and the type of treatment being carried out, e.g., coagulation, lime softening, filtration, chemical feeding.

According to Kentucky state legislation, Class IA plants include all facilities using physical treatment and disinfection and serving a population less than 500. Class IB includes all plants using disinfection only and serving a population less than 500.

Class II, and III provide the same basic program categories of service; however, there is a distinction in the populations served.

The three categories of services include:

1) Type A - All plants using physical and chemical treatment including chemical coagulation and/or water softening processes, filtration and disinfection.

2) Type B - All plants using physical treatment or disinfection.

3) Type C - All plants using disinfection only.

Class II plants serve the following populations by treatment type: Type A - less than 3,000; Type B - equal to or greater than 500 and less than 3,000; and Type C - equal to or greater than 500 and less than 3,000. Class III plants serve the following populations by treatment type: Type A - greater than 3,000 and less than 15,000 population; Type B - equal to or greater than 3,000 population; and Type C - equal to or greater than 3,000 population.

Class IV plants are classified as all facilities using physical and chemical treatment including chemical coagulation and/or water softening processes, filtration and disinfection and serving a population equal to or greater than 15,000.

The majority of the Kentucky public water supplies are in the Class I and Class II categories. The Class I plants generally provide basic disinfection treatment. The highest percentage of Class II plants use physical and chemical treatment, including chemical coagulation and/or water softening, processes, filtration and disinfection.

The Water Distribution Systems are also categorized into four basic classes based upon population:

1) Class I: All distribution systems serving a population of less than or equal to 1,500.

2) Class II: All distribution systems serving a population of greater than 1,500 and less than or equal to 15,000.

3) Class III: All distribution systems serving a population of greater than 15,000 and less than or equal to 50,000.

4) Class IV: All distribution systems serving a population of greater than 50,000.

There are a total of 755 water distribution systems within the state: 506 Class I, 227 Class II, 10 Class III, and 12 Class IV.

The preceding information is based on totals supplied by the Division of Sanitary Engineering.

The Kentucky Board of Certification of Water Treatment Plant, Water Distribution System and Wastewater Treatment Plant Operators is the certifying authority. In 1976, there were 601 water treatment plant operators and 116 water distribution system operators certified. The following tables depict the number of operators for water treatment plants and water distribution systems who were certified as of December 1976.

TABLE VII

COMMONWEALTH OF KENTUCKY

Certified Water Treatment Plant Operators

Classification	1976
IA	38
IB	4
IIA	81
IIB	7
IIC	46
IIIA	276
IIIB	13
IIIC	10
IV	126
TOTAL	601

TABLE VIII

COMMONWEALTH OF KENTUCKY

Certified Water Distribution System Operators

Classification	1976
I	11
II	28
III	30
IV	47
TOTAL	116

Many treatment plants do not have certified operators. Program officials computed that the 601 certified operators are employed in 256 water treatment plants. Further, the Division indicated that the 116 certified water distribution plant operators are employed in as few as 58 systems.

C. Workforce Projections

The Division of Sanitary Engineering is expected to grow by about 21% annually during the next five years. The growth of the Division is directly attributable to the increased responsibilities mandated through the Safe Drinking Water Act. The following table represents estimated growth by occupation for the next five years.

TABLE IX

DEPARTMENT FOR NATURAL RESOURCES
AND ENVIRONMENTAL PROTECTION

Division of Sanitary Engineering
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	9	9	11	14	16	18	n/a	15%
Technical Support	4	5	7	10	14	14	n/a	30%
Other	5	5	8	9	10	11	n/a	19%
Total	18	19	26	33	40	43	20%	20%

As demonstrated on the preceding table, the Division expects to increase its total staff from 19 to 26 persons by October, 1977. The staff increase will include two technical support positions, two sanitary engineers, and three clerical data processing positions. An additional seven engineers will be added to the staff between 1978 and 1981. These engineers will function through the District Office and will assist with enforcement of the Safe Drinking Water regulations.

The Division recruits through the Kentucky Merit System and the Department's Personnel Office. The Division has experienced some difficulty in recruiting experienced engineers, data processing personnel and environmental specialists. This problem is attributed to the non-competitive salaries and stringent qualifying requirements of the Merit System.

The turnover for the Divison has been averaging approximately 20% per annum during the past three years; however, this is expected to decline sharply as the program is expanded. The turnover has been typically in the Engineering positions. Engineers are frequently offered higher paying positions with private industry.

During the next five years, the water district concept and function will be reorganized. The state is attempting to promote a water district regional concept whereby water supplies are purchased from a regional water district. This program will have a major impact upon the public water supply delivery structure within the state. Officials indicated that approximately one half of the Class IB treatment plants will be replaced by distribution systems in the future. It is further anticipated that up to one-third of the Class IIA plants will similiarly be phased out. This will amount to as many as one-fourth of the state's treatment plants being replaced by regional water district programs during the next five years.

While there may be an actual decrease in the number of operational water treatment plants, the number of certified water treatment operators is expected to grow during the next five years. The law requires that there must be a certified operator in charge of the water treatment plant at all times. Kentucky has developed plans to meet the expanding need for certification of treatment plant operators. Over the next five years, program officials plan to train and certify a total of 2,124 operators for both water treatment and water distribution systems: 1,275 plant operators and 849 distribution system operators. The largest increase is expected to be in the Class IV operators; the number of certified operators is expected to grow from 126 to over 400 by 1982. Little change is expected in the Class I, Class II, Class III programs.

The following tables depict estimated workforce projections for certified water treatment plant operators and distribution system operators.

TABLE X

COMMONWEALTH OF KENTUCKY

Certified Water Treatment Plant Operators
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
IA	38	50	58	68	78	88	n/a	18%
IB	4	40	90	120	160	200	n/a	223%
IIA	81	81	81	81	81	81	n/a	0
IIB	7	7	7	7	7	7	n/a	0
IIC	46	80	100	120	160	200	n/a	35%
IIIA	276	276	276	276	276	276	n/a	0
IIIB	13	13	13	13	13	13	n/a	0
IIIC	10	10	10	10	10	10	n/a	0
IV	126	181	236	291	346	400	n/a	26%
TOTAL	601	738	871	986	1131	1275	n/a	16%

TABLE XI

COMMONWEALTH OF KENTUCKY

Certified Water Distribution System Operators
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
I	11	25	39	53	67	81	n/a	53%
II	28	63	98	134	169	205	n/a	53%
III	30	68	106	144	182	220	n/a	53%
IV	47	86	125	164	203	243	n/a	41%
TOTAL	116	242	368	495	621	749	n/a	48%

Thus the Division expects that there will be approximately 2,000 operators certified within the next five years. If this number is certified, it will

achieve its goal of having at least one certified operator for each treatment plant or distribution system. The Division estimates that at least 175 new entrants will seek certification and training each year. An additional 100 operators will request skill upgrade training.

D. Training and Certification

Staff members of the Division of Sanitary Engineering are encouraged to participate in continuing education. Tuition grant programs are available through the division for persons who qualify. If an engineer has been employed with the Division for at least two years and wishes to obtain a Master's degree, the Commonwealth will sponsor the person while she/he returns to school. The Program includes full tuition and salary while the employee is in school.

The Kentucky Department for Natural Resources and Environmental Protection sponsors an annual certification program for water treatment plant, distribution system, and wastewater treatment plant operators. Training for Water and Wastewater Operators is offered through one central seminar and eight regional workshops. Approximately 600 persons attended training through these programs. The workshops are usually offered for between five and six days.

The Division of Sanitary Engineering recently completed 15 regional training seminars (May 1977) to familiarize persons with the provisions of the Safe Drinking Water Act. A total of 527 persons participated in these training seminars.

E. Career Potential

Career prospects for all levels of personnel involved in the state public water supply program are extremely optimistic. The career

opportunities within the state will continue to grow during the next five years as a consequence of the implementation of the Safe Drinking Water Act.

The Division of Sanitary Engineering is expected to expand its staff by 21% per year. The demand for personnel will be in the engineering and technician categories. The basic thrust of the new employee activities will be upon enforcement of the Safe Drinking Water Act regulations within the districts.

Career opportunities within the private sector will be more stratified. Growth is projected for Class IA, Class IB, Class IIC, and Class IV. No expansion is anticipated for the remaining classes.

Alternatively the water distribution systems are expected to experience a significant expansion during the next five years. The Class IV systems will grow an average of 40% per annum. The growth of the Class I, II, and III systems is projected at 35% per year. This growth is a directly correlated to the reorganization of the regional water district programs.

F. Conclusion

Three basic conclusions can be drawn from the preceding information available on the status of the public water supply workforce in the Commonwealth of Kentucky:

1) that the Safe Drinking Water Act will exert a major impact upon the staffing of the Division of Sanitary Engineering;

2) that the state is organizing a program which proposes to certify approximately 2,000 water treatment plant and water distribution system operators during the next five years;

3) that the state and local water treatment plants have experienced some difficulty in locating certified/ qualified applicants for available positions.

These conclusions suggest that the water supply field in the Commonwealth of Kentucky will continue to grow during the next five years. Further, there is a need for expanding educational/training programs to address the specific public water occupational needs.

V. RADIATION

A. Introduction

In 1962, Kentucky become the first state to have an agreement with the Atomic Energy Commission to regulate and license all users of radioactive materials in the state. Kentucky also started a program in 1961 to register and inspect all X-ray machines in Kentucky.

The Office of Radiation Control is located within the Bureau for Health Services in the Kentucky Department for Human Resources. The program derives its statutory authority for such radiation safety inspections from KRS 152.690 and KRS 152.990. KRS 152.690 states that the "Secretary of the Department for Human Resources shall provide by regulation for the licensing of the possession or use of any source of conveying radiation and the transportation, handling and disposal of radioactive wastes. Such regulations may specify the form of application for license, the qualifications therefore, grounds for revocation of same by the issuing agency and such other matters as may be needed to make licensing effective as a means of control."

The Office of Radiation Control also sells contractual services to the federal government for Kentucky's inspection of new, certified and federally-controlled X-ray equipment.

With regard to the inspection and regulation of non-ionizing radiation producing machines, the Office of Radiation Control will inspect such machines as lasers and microwave ovens only when there is a complaint or a request to do so.

The Office has regulatory authority through a broad enabling type of legislation. They will also inspect such machines at federal installations whenever the federal government so requests.

Maxy Flatts, Kentucky, is the site of one of two nuclear burial facilities in the nation. The facility is operated by the Nuclear Energy Corporation and the site is responsible for the nuclear disposal for the eastern portion of the United States.

B. Workforce Profile

The Office of Radiation Control is divided functionally into a Radioactive Materials Section, a Radiation Producing Machines Section and a Field Staff. The Kentucky Radiation Control program has field offices in London, Lexington, Louisville and Hopkinsville. The staffing level, by office section, is set forth in the following table.

TABLE XII

KENTUCKY DEPARTMENT FOR HUMAN RESOURCES

Bureau for Health Services
Office of Radiation Control

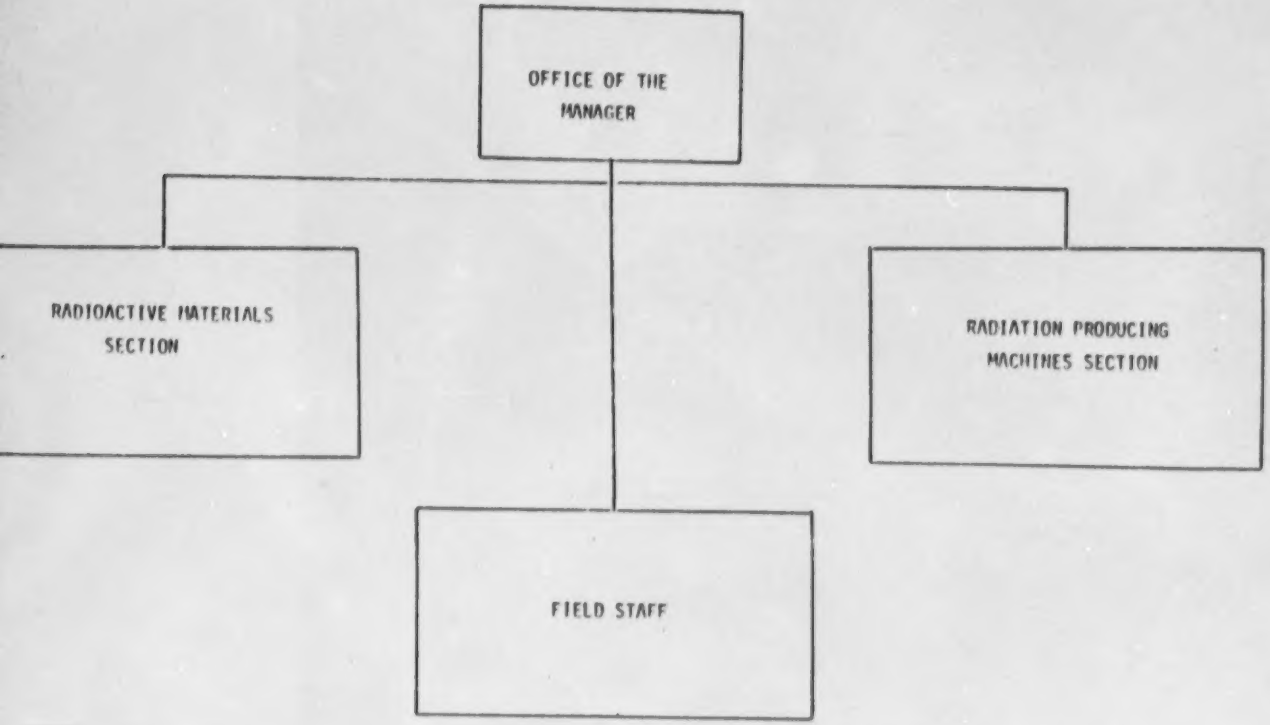
Current (1976) Section Staffing Level

Section	1976
Radioactive Materials	7
Radiation Producing Machines	5
Field Staff	7
Administrative	3
TOTAL	22

The Radioactive Materials Section is responsible for the monitoring of emissions from radioactive materials to the environment. This section's staff conducts an annual check of facilities using radioactive materials to ensure that there is no unsafe leakage into rivers and streams or onto plants and crops. Persons who wish to use, possess, transfer or store radioactive materials in the state, submit an application to the Office of Radiation

Figure 5

OFFICE OF RADIATION CONTROL



Control for license in order to carry out such activities. The licensee is periodically visited by the Office's staff to ensure that the operations and activities with regard to the use of such materials are conducted in a safe manner.

The Radiation Producing Machines Section is charged with the inspection and registration of X-ray machines, microwave and laser devices and any other devices which may emit radiation which could prove harmful. Staff in this section have the responsibility to ensure that facilities which use such devices meet certain safety requirements and provide a margin of safety for both the recipients and users of such devices. X-ray machines must meet certain requirements established by the Kentucky Board of Health and every such machine has a scheduled safety evaluation performed on it. Occupational categories of Office personnel are set forth in the following table.

TABLE XIII

KENTUCKY DEPARTMENT FOR HUMAN RESOURCES

Bureau for Health Services
Office of Radiation Control

Current (1976) Staffing Level

Position	1976
Health or Radiation Physicist	9
Chemist	1
Biologist	1
Technician	4
Other	7
TOTAL	22

The Health or Radiation Physicist category includes two section supervisors and seven staff radiation physicists. The biologist is a microbiologist. The Technician category includes a laboratory assistant and three radiation physicist associates. The "Other" category includes a public

health representative, chief clerk typist, clerk, clerk-steno, manager, assistant manager and an administrative secretary.

The turnover rate for the Office of Radiation Control has varied among job classifications depending on salary schedule changes. A series of salary increases has stabilized the turnover rate in most job categories. Officials estimate that the turnover rate is between 5% and 6% annually; this generally translates to one or two people per year.

The Energy Research and Development Administration's Union Carbide-operated Gaseous Diffusion Plant at Paducah has two radiation monitoring personnel on its staff. Union Carbide is the largest employer of radiation monitoring personnel in Kentucky.

Industry normally employs radiation safety officers to perform radiation monitoring tasks. There are no local programs in the state which perform radiological health functions.

C. Workforce Projections

The Assistant Manager of the Office of Radiation Control projected that there may be reorganization within the Bureau for Health Services and the Office within the next two years so the current staffing profile may change. Very little growth is projected for the 1977 to 1982 period. One person will be needed to monitor and inspect federal X-ray equipment for 1977.

The Office of Radiation Control plans to implement a program for the certification of radiation producing equipment operators. Plans are to hire two more persons in 1977 to conduct that program. It will be conducted by a Health Physicist who has a B.S. degree in related sciences and an American Registered Technologist with an X-ray Technician diploma. Projected growth rates are shown in the following table.

TABLE XIV

OFFICE OF RADIATION CONTROL

Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/Annum Turnover Average	%/Annum Growth Average
Health or Radiation Physicist	9	10	10	10	10	10		2%
Chemist	1	1	1	1	1	1		0%
Biologist	1	1	1	1	1	1		0%
Technician	5	7	7	7	7	7		8%
Other	7	7	7	7	7	7		0%
TOTAL	23	26	26	26	26	26	5-6%	3%

The Radiation Control program recruits through the state merit examination system and interviews the top five from the register. The Chief Chemist position has proven difficult to fill as it requires a person to have a Chemistry degree as well as 4 years experience. The Senior Radiation Physicist is also difficult to fill as it requires a degree plus four years of experience.

It was also noted that workforce increases may result from a more intense program of radiation producing machine regulation. An undetermined number of inspectors may be needed for the control of non-ionizing radiation sources.

D. Training and Certification

The Office of Radiation Control currently has not implemented its planned certification program for radiation producing machine operators, but certification is scheduled to begin in 1977. The Office also has an internal training program which is conducted by the staff microbiologist. This

effort will involve the use of Bureau of Radiological Health Training kits, films and other materials; this internal training program will be financed by the state.

Staff personnel can also attend job-related courses at Universities and the Office of Radiation Control pays tuition expenses. Staff are allowed to take an educational leave while they are working toward Master's Degrees. Most of the professional staff of the Office are obtaining post-graduate education. The Radiation Control program's Assistant Manager feels that for the purpose for which they were intended, the caliber of education available from educational institutions is very good.

E. Career Potential

The Assistant Manager of the Office of Radiation Control said that the growth in the Health Physics profession has been relatively recent. Private Radiation Safety officers provide their services as consultants to facilities using Radiation Safety Offices. This official projects that the career potential for health physicists in Kentucky to be good during the next five years. There are new nuclear reactors being constructed on Kentucky's borders in adjoining states and they will require either nuclear or health physicists on their staffs but not in great numbers.

The recent cold winter and shortage of natural gas supplies may cause more nuclear reactors to be constructed to cope with this energy crisis. The concern for the health and safety aspects will affect the passage of new legislation and technology to protect the citizenry.

F. Conclusion

Current projections for the next five year period do not foresee much growth in the radiation control field on the state level. There may be a demand for technicians to monitor and register non-ionizing radiation producing machines within the next five years, and some openings may also occur for radiation inspectors. The career potential for health physicists is thought to be good, and the upgrade program available in Kentucky will increase the attractiveness of positions in the state.

VI. SOLID WASTE

A. Introduction

Solid waste management control functions are assigned to the Kentucky Department of Natural Resources and Environmental Protection. Chief authority is provided by Kentucky Revised Statutes (KRS) Chapter 224. This chapter requires that permits be obtained for the construction and operation of solid waste disposal sites or facilities. Permits are also required for collecting, hauling or disposing of hazardous wastes. Hazardous wastes are defined as any substances or combination of substances the disposal of which may create a threat to public health or to animal and aquatic life forms.

KRS Chapter 109 enables county fiscal courts and cities to establish one or more garbage and refuse disposal districts. These districts are overseen by boards of directors, which are responsible for the preparation of collection and disposal plans that must be approved by the State.

Kentucky contains 15 Area Development Districts that identify priority needs within their jurisdiction on a large variety of issues and carry out the appropriate planning. Each of these Districts has addressed solid waste problems to some degree. Some have participated in resource recovery feasibility studies, while others have worked with the State in upgrading landfills and developing collection mechanisms. The Department for Natural Resources and Environmental Protection assists the Districts in identifying problem areas related to solid wastes and provides input into the planning processes. Eleven of the fifteen Districts have developed solid waste inventories which are used as a basis for developing new landfill sites and plans.

With the passage of the Federal Resource Conservation and Recovery Act, a new State law may be required to deal with solid waste management, hazardous materials and resource recovery. The Department is now beginning to research legislative needs, and is carrying out studies that will aid in determining future programs to be developed as a result of the Act. Although the full impact of the Act cannot yet be accurately predicted, due to its recent passage, State sources indicate that workforce levels will increase dramatically.

B. Workforce Profile

Implementation of the State's solid waste laws is charged to the Division of Solid Waste, Bureau of Environmental Protection. Among the objectives of the Division are the following:

1) To develop and enforce applicable laws and regulations;

2) To inspect all solid waste disposal sites in the State;

3) To carry out a permitting program for disposal systems sites;

4) To provide technical assistance to fiscal courts, city commissions, Garbage and Refuse Disposal District Boards and Area Development Districts in planning, developing and promoting acceptable disposal systems;

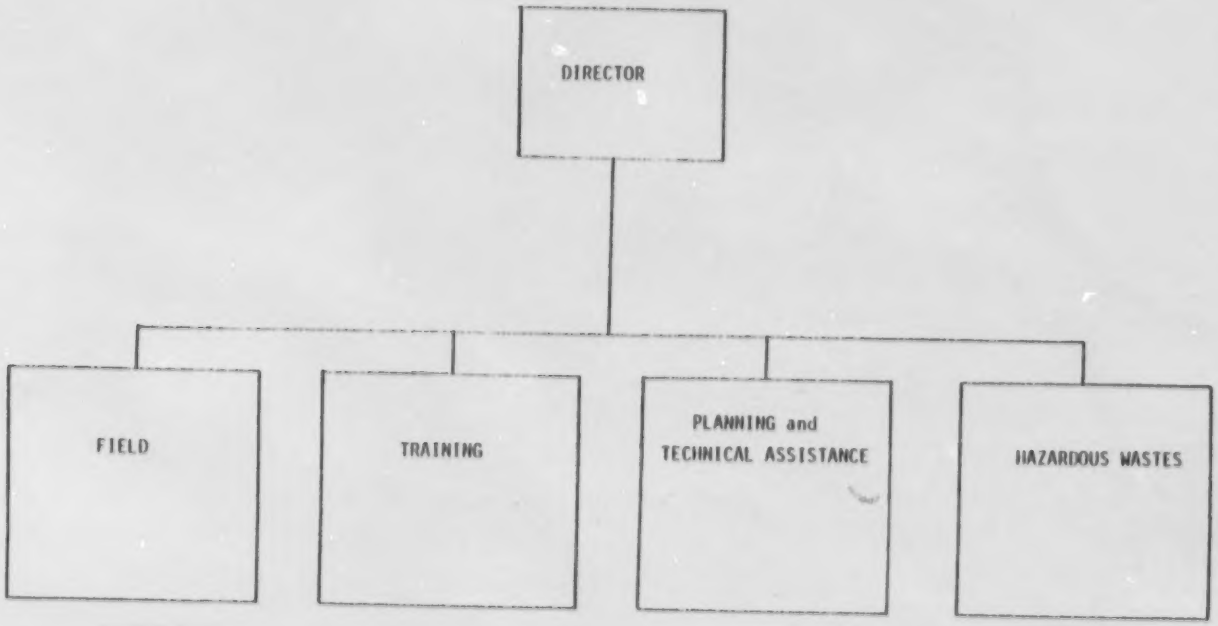
5) To inspect disposal facilities for hazardous wastes, inspect facilities for treatment of hazardous wastes, and conduct a hazardous waste inventory;

6) To perform the needed surveys and backup work for developing a program consistent with the goals of the Federal Resource Conservation and Recovery Act.

During 1976, the staffing level of the Division of Solid Waste was 33. This figure includes one environmental engineer director, one division administrator, one civil engineer, five environmental supervisors, three sanitary

Figure 6 KENTUCKY DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

Bureau of Environmental Quality
Division of Solid Waste



engineers, five environmental supervisors, three sanitary engineers, thirteen public health representatives and nine clerical employees. Engineers must have graduated from college with a bachelor's degree in engineering and have two years of experience in the field, or have master's degrees in public health or engineering and one year of experience. With increasing amounts of experience and/or education and having been registered as professional engineers in the state, engineers may advance to become principal or chief engineers, which are supervisory positions. Environmental Supervisors I must have graduated from college and have four years of progressively responsible administrative experience, two of which must be in the area of natural resources, environmental control, or a closely related field. Advancement is contingent upon increasing amounts of education and/or experience. Public Health Representatives I must have bachelor's degrees with courses in the biological, physical or social sciences. Experience in the field is equivalent to the required education on a year-for-year basis. In this case, additional education and/or experience is required for advancement.

The Division of Solid Waste contains four major programs: Hazardous Wastes, Planning and Technical Assistance, Training, and Field. The field personnel, located in four district offices, provide services for the first three programs: inspecting permitted disposal site, investigating open dumps, and providing assistance to Area Development Districts, counties and cities, and landfill operators. Fifteen of the Division's 33 positions are in the district offices.

The following cable indicates the number of positions within the Division of Solid Waste:

TABLE XV

KENTUCKY DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

Division of Solid Waste

Current (1976) Staffing Level

Position	1976
Engineer	5
Scientist	19
Other	9
Total	33

In Kentucky, there are 160 landfills, approximately 45% public and 55% private. State sources indicate that there is an average of one operator at each site, although State personnel encourage the use of attendants, scale operators, and spotters, especially at larger sites, of which there are three in the State according to sources. The number of personnel other than operators fluctuates, and these persons are often hired through federal manpower programs, and must leave when the funding terminates.

There are no specified hazardous waste disposal sites in Kentucky. The greatest portion of these wastes are generated in the northern portion of the State, and are often sent to Indiana or Ohio, where facilities are available that treat and dispose of hazardous wastes. Under a contract with the U.S. Environmental Protection Agency (EPA), the Division is performing a survey to identify hazardous wastes generated in the State. Before the survey is completed, which is projected for September of 1977, Division personnel will have interviewed an estimated 80% of all generators of hazardous wastes. The information being gathered includes the types of wastes generated, physical states, treatment, collection and hauling systems, and disposal methods. State sources anticipate that the completed survey will provide the Division with the following outputs:

1) A base from which to establish a hauler licensing program (37 haulers have been identified);

2) Criteria from which to establish adequate disposal site control;

3) An information base from which to initiate a state level hazardous material management program.

Resource recovery systems have not yet been established within the State, and activity that is carried out in this area is usually of a temporary nature, carried out by civic groups and organizations. As much of Kentucky is rural, and waste collection is not mandatory, resource recovery has not yet proven to be a viable or economically feasible alternative. Three urban areas of the State, however, are conducting feasibility studies for facilities that would furnish derived fuel for industries. Lexington is in the final stages of such a study, which is being carried out under a federal grant. Louisville Gas and Electric is also carrying out a study, as is Jefferson County.

C. Workforce Projections

The Division of Solid Waste has proposed a reorganization plan due to the requirements of the Federal Resource Conservation and Recovery Act. Under this plan, the name will be changed to become the Division of Hazardous Materials and Waste Management. This new Division will include both the present Division of Solid Waste and the Pesticides Section of the Department for Natural Resources and Environmental Protection. The reorganization plan has been accepted at the Departmental level, has been approved by the Governor, and will become effective June 1, 1977.

Division administrators anticipate that this new Division will require a four-fold increase in staffing level over the Division of Solid

Waste's current level. Most increases will take place in 1978, with the balance of the positions being added in 1979. If the workforce increases to the projected level, the new Division will have 132 positions by 1979. Sixteen of these would be transferred from the Pesticides Section, and 33 from the Division of Solid Waste, leaving 83 positions to be filled. The majority of these positions will be filled with professionals such as engineers, geologists, hydrologists, toxicologists and chemists. Specific needs will become more apparent as state roles are further defined at the federal level, and as Kentucky's needs and problems are further identified at the State level.

Turnover has been nearly nonexistent in the Division of Solid Waste during the past several years. When hiring needs occur, administrators rely upon the State Merit System for the recruitment of new employees.

The number of landfill operators is expected by State sources to remain relatively stable, at approximately 160, during the next five years, as are the numbers of scale operators, attendants and spotters. The number of landfill sites may decrease, as the Division is encouraging the consolidation of smaller sites into larger regional sites. Also facilitating site consolidations is the fact that a number of jurisdictions have developed stringent land-use plans that eliminate most suitable land for landfilling. Consolidations should not cause a decreased requirement for landfill operators, as those operating landfills to be closed will be diverted to the larger regional landfills.

The turnover rate for landfill operators is very high. It is often the case that once a person has had experience in operating a landfill, he/she is able to find more lucrative employment with private concerns that utilize heavy equipment operators.

Although figures are presently unavailable regarding the number of persons involved in collection, State sources project that the workforce may double within the next five years. Collection systems in the State will be developed and expanded, and transfer stations may be utilized.

The future workforce involved in hazardous waste management will largely be contingent upon the type of management program that is developed by the Division. As the field appears to be destined toward rapid expansion, it appears that needs will substantially increase for professionals with expertise in the field. Likewise, the future of resource recovery will be contingent upon federal policies and incentives, State decisions and needs, and the outcome of feasibility studies currently being conducted within the State.

D. Training and Certification

Because of budget restraints, the Division has had to cut back on training offered to its personnel. Three persons have in the past attended night school in the area of community development under the sponsorship of the State, and professionals on occasion attend local university courses. Every other month a meeting is held for field representatives into which some type of solid waste training is incorporated.

Region IV EPA has formed the Southeast Solid Waste Training Committee which is made up of state solid waste directors and regional solid waste personnel. The Committee critiques training needs and provides training for identified needs. The first course was offered in November of 1976 on "Elements of Solid Waste Management", and Kentucky personnel plan to continue to participation in this group.

There are no vocational curricula available in the State for landfill operators, although the Division has encouraged the development of such programs. The Division has offered informal one-to-one training to landfill operators, although this activity has temporarily ceased. Recognizing a need for upgrading operator skills, the Division is in the process of forming a program of information and education chiefly geared toward landfill operators. Modules will be developed to cover many segments of solid waste and hazardous material management. Plans have not as yet been completely formulated, but needs are being surveyed.

Specific needs that have been identified thus far for the training of landfill operators include the following:

1) Excavation methods;
2) Methods for storing, stockpiling and covering material;
3) Achieving adequate compaction;
4) Identifying and dealing with specific problems;
5) Controlling and identifying leachate.

The Division has attempted to provide informational seminars to public officials, but the offerings have been met by a lack of interest. Training sessions have been held for consulting engineers, in which laws and regulations were explained. State officials have considered these sessions successful.

E. Career Potential

Within the Division of Solid Waste, opportunities are expected to develop for professionals in the areas of engineering, hydrology, geology

and other related fields. Divisional needs will become increasingly apparent as federal guidelines are issued and State program needs are further defined.

The number of landfill operators is not expected to increase although the high turnover rate should create opportunities for those wishing to enter the field. Demands will increase for operators with skills acquired through training and/or hands-on experience, although this type of training is not currently readily available in the State. Those in the field may find training available within the next several years. Increased requirements in collection are projected, and skills in this area will also require upgrading regarding the handling and transfer of wastes.

The passage of the Federal Act may require that those involved in collection, transfer, storage and disposal of wastes have some degree of expertise in hazardous waste management and resource recovery. Opportunities should also increase for highly skilled professionals in the private sector for dealing with the more stringent federal and state requirements. Again, impacts will become increasingly apparent during 1977, as implementation of the Act commences.

F. Conclusion

As a result of the passage of the Federal Resource Conservation and Recovery Act, the Division of Solid Waste may undergo reorganization, and staffing levels are expected to dramatically increase. Current programs will be continued, and in addition, hazardous wastes will be tracked and regulated from the point of generation to the point of disposal, a waste hauler licensing program will be implemented, and resource recovery systems

may be developed. A training program to deal with many facets of the field, chiefly geared toward landfill operators, will be developed.

There are no designated hazardous waste disposal sites in the State, and resource recovery activities are not taking place at a high level. Three feasibility studies are being carried out regarding energy conversion, and hazardous waste disposal sites may be developed, contingent upon the results of a waste survey that is being carried out by the Division.

The number of landfill operators is not expected to increase, although the number of persons involved in collection is expected to double within the next five years. State sources predict that an upgrading of skills will be required, especially for landfill operators, which will hopefully be met through the training program to be developed by the Division. If fully implemented, this program may assist in offsetting the lack of vocational curricula in the field of solid waste.

VII. WASTE WATER

A. Introduction

The control of water pollution in Kentucky is primarily carried out under the authority of Kentucky Revised Statutes (KRS) Chapter 224. Implementation is given to the Department for Natural Resources and Environmental Protection. Pursuant to sections of Chapter 224, the following regulations have been developed by the Department:

401 KAR 5:005 - Embodies requirements needed to effectuate KRS 224, permit authority for sewage systems. Requires a permit prior to construction and operation of a sewage system and sets forth requirements for receiving a permit to construct and operate such a system.

401 KAR 5:015 - Requires that spills and bypasses from sewage systems be reported to the Department.

401 KAR 5:025 - Provides narrative water quality standards for all waters and sets forth a use classification scheme with numeric criteria for applicable waters.

401 KAR 5:035 - Applies the use classification system found in 401 KAR 5:025 to certain waters, and mandates that all persons discharging pollutants through point sources shall apply "best practicable control technology" and "best available technology economically achievable" by certain dates.

401 KAR 5:045 - Requires a minimum of secondary treatment for publicly-owned and other certain facilities which receive biodegradable wastes, a minimum of best practicable control technology or best available technology economically achievable for other facilities which receive biodegradable waste, and additional treatment in certain situations. The regulation requires that such treatment facilities receiving such wastes reapply to the Department prior to January 1, 1977, for a permit to continue operating.

The Department has applied to the Environmental Protection Agency (EPA) to carry out the NPDES permitting program in Kentucky. Because EPA does not feel that the Department has sufficient fining authority,

NPDES responsibility has not yet been granted. The Department is working toward gaining the required authority, is drafting NPDES permits, and expects to be able to assume appropriate responsibilities within the next several years.

KRS Chapter 223 and KRS Chapter 224-135 provide for mandatory certification of all personnel of wastewater treatment plants in the State. Plants are classified according to complexity of treatment and the sizes of population served. Every operator-in-charge must be certified at the level of the plant, while all others may be certified at any level.

According to State sources, there are approximately 206 municipal wastewater treatment plants currently operating. In addition, there are an estimated 500 industrial plants in operation, and 3,500 to 4,000 package plants that may only carry out water cooling, but require the presence of a certified operator.

B. Workforce Profile

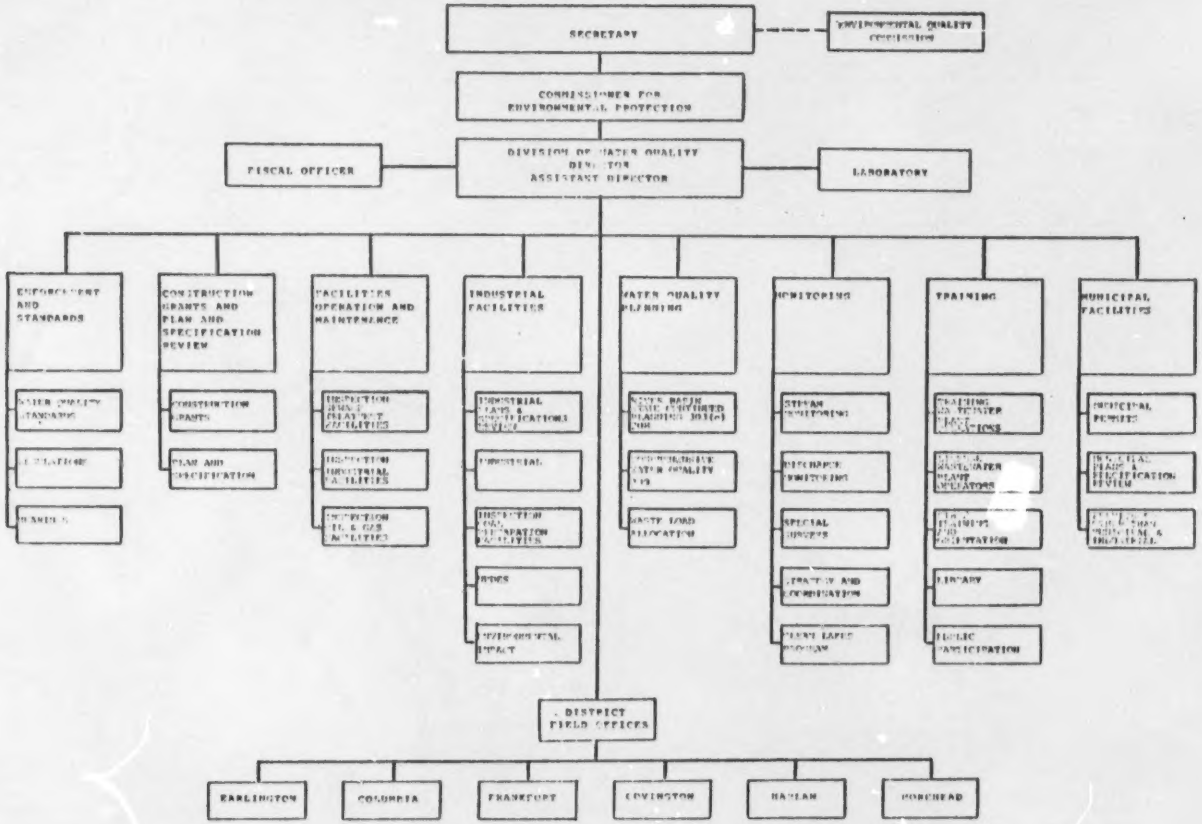
Within the Department for Natural Resources and Environmental Protection, chief responsibilities for water pollution control are carried out in the Division of Water Quality of the Bureau of Environmental Protection. The Division is made up of nine subprograms, as follows: Enforcement and Standards, Construction Grants Plans and Specification Review, Facilities Operation and Maintenance, Industrial Facilities, Water Quality Planning, Monitoring, Training, Municipal Facilities and Laboratory. In addition, supporting services are carried out within six staffed district offices. These district offices are:

Earlington Field Office
Columbia Field Office
Frankfort Field Office
Northern Kentucky Field Office
Harlan Field Office
Morehead Field Office

Figure 7

DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

DIVISION OF WATER QUALITY



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Among the objectives of the Division of Water Quality are the following:

1) To enforce applicable laws, water quality standards and regulations;

2) To manage the PL 92-500 construction grants program and provide engineering review and approval of plans and specifications for wastewater facilities;

3) To inspect all wastewater treatment facilities in the State, including compliance monitoring and O & M;

4) To issue construction and operations permits for municipal, industrial, commercial and other wastewater treatment facilities;

5) To carry out planning activities pursuant to Sections 208 and 303(e) of PL 92-500;

6) To conduct special surveys, stream monitoring and strategy development and coordination;

7) To train Division personnel, and license and train wastewater plant operators;

8) To carry out all necessary analytical services.

Legal services are provided by the Department's Office of General Counsel. In addition, the Environmental Division of the Attorney General's office represents the public interest involving environmental concerns and initiates suits when necessary, functioning independent of the Department for Natural Resources and Environmental Protection.

As of September, 1976, there were 100 persons employed in the Division of Water Quality. An additional 14 positions were budgeted but vacant, and administrators expected that these positions would be filled during 1977. Sixty of the filled positions were in the nine subprograms in Frankfort, while the remaining persons worked in the Division's district offices. The

100 positions are broken down as follows: 13 environmental supervisors, 16 sanitary engineers, one civil engineer, three sanitary engineering associates, two sanitary engineering assistants, 24 environmental specialists, four chemists, one compliance officer, eight environmental control inspectors, three oil and gas inspectors and 25 "other personnel". The latter category includes one executive officer, one business manager, one administrative assistant, one technical assistant, one keypunch operator, one planner, six laborers for sample-collecting (or five person-years) and 14 clerical employees.

Environmental supervisors must have college degrees with administrative experience in the area of natural resources, environmental protection or a related field. Sanitary engineering assistants must have a bachelor's degree in engineering, while sanitary engineering associates must have a bachelor's degree and one year of experience or a master's degree in public health or sanitary engineering. With additional experience and/or education, persons can progress to become sanitary engineers, senior sanitary engineers, principal sanitary engineers or chief sanitary engineers.

Environmental Specialists I must be college graduates with 15 hours in the physical or biological sciences, or have two years of experience as environmental control inspectors. With additional education and/or experience, persons may progress to become environmental specialists IV. Oil and gas inspectors must have college degrees with majors in chemistry, geology or engineering, with two years of experience in varied oil field work.

Environmental control inspectors must have graduated from high school with courses in mathematics and one year of investigative experience, while senior inspectors must have had two years of experience or have completed

an environmental vocational school course or college coursework. Compliance officers must be high school graduates with six years of responsible work experience including direct contact with the public, or an equivalent combination of training and experience.

The following table depicts the current workforce level within the Division of Water Quality:

TABLE XVI
KENTUCKY DEPARTMENT FOR NATURAL RESOURCES
AND ENVIRONMENTAL PROTECTION
Division of Water Quality
Current (1976) Staffing Level

Position	1976
Engineer	22
Scientist	44
Technician	9
Other	25
Total	100

Officials within the Division of Water Quality estimated that there are approximately 1,400 certified operators of wastewater treatment plants in the State, (municipal, industrial, and package) with the majority being at the lowest level, Class I. All operators must have at least a high school education with increasing amounts of experience required at higher levels. Operators of Class IV plants must have at least a bachelor's degree in science or engineering, although not all plants have been able to meet this requirement.

The following table depicts estimates of the current numbers of certified wastewater plant operators, by classification:

TABLE XVII

COMMONWEALTH OF KENTUCKY

Certified Wastewater Treatment Plant Operators
Current (1976) Staffing Level (est.)

Classification	1976
I	900
II	400
III	65
IV	35
Total	1,400

State sources estimate that there are an additional 800 uncertified operators in the State. The majority of these persons are in industries and in package plants. Laboratory technicians and other specialized plant personnel are required to be certified, and are included in the above figures.

Those industries that retain certified and non-certified operators include utilities, chemical plants, steel plating plants, creameries and clothing plants. In addition, coal mining operations such as washing plants and bath houses carry out operations that require the presence of an operator. Kentucky also contains a number of distilleries that must employ certified operators, typically utilizing engineers, chemists and technicians, according to sources in the field.

Two areas of Kentucky are impacted by Section 208 designated areawide planning agencies. One of these agencies, the Kentuckiana Regional Planning and Development Agency, is located in Louisville, Kentucky. Located in Cincinnati, Ohio, is the Ohio-Kentucky-Indiana Regional Council of Governments which includes portions of northern Kentucky in its basin planning efforts. Staffs for this type of planning tend to be quite small, and most work is conducted by contracting to other agencies and consulting firms.

C. Workforce Projections

The fourteen vacant positons budgeted during 1976 will be filled in 1977. In addition, a third professional for training was added early in 1977. For continued maintenance of existing programs, increased activity in river basin management, expansion of bacteriological monitoring, and expansion of staff training, administrators project that an additional twelve persons will be added by 1982, consisting of engineers, scientists, technicians and other personnel. If the Division assumes NPDES permitting responsibilities, as is anticipated, an estimated ten persons, both specialists and engineers, will be required in Frankfort for permit preparation and review, while ten to twelve district personnel, again,both engineers and specialists will be required for enforcement activities. State sources hope to be able to place an engineer in every field office.

The annual turnover rate within the Division of Water Quality is less than eight percent. Engineers and non-professionals exhibit the highest degree of turnover, and most professionals leave in order to further their educations.

The following table depicts projected workforce levels within the Division of Water Quality, based upon input from sources in the field. Those required for implementation of an NPDES program are included.

TABLE XVIII

KENTUCKY DEPARTMENT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION

Division of Water Quality

Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	% Turnover (Average)	% Growth (Average)
Engineer	22	26	28	30	32	34		9%
Scientist	44	50	55	60	65	70		10%
Technician	9	9	9	10	10	10		2%
Other	25	30	31	32	33	33		6%
Total	100	115	123	132	140	147	8%	8%

Most vacant positions are filled through the State Merit System. As engineers are difficult to locate in this manner, Division administrators have carried out recruitment through colleges and universities to attain engineering capabilities.

During the past several years, the Division has been certifying an average of 400 operators per year. Administrators anticipate that this trend will continue, with approximately 400 new certificates issued annually during the next five years. Additions are due to efforts on the part of State personnel to enforce the certification law, and to the increasing complexity of wastewater plants. For the latter reason, a larger growth rate is expected to occur in Classes III and IV than in Classes I and II, although the greatest numbers of persons will remain in the latter two grades.

The following table depicts estimates of future numbers of certified wastewater treatment plant operators, based upon input from State professionals:

TABLE XIX

COMMONWEALTH OF KENTUCKY

Certified Wastewater Treatment Plant Operators
Workforce Projections to 1982 (est.)

Classification	1976	1977	1978	1979	1980	1981	% Average/Annum Growth/Decline
I	900	1,140	1,380	1,620	1,860	2,100	19%
II	400	500	600	700	800	900	18%
III	65	101	137	173	209	245	31%
IV	35	59	83	107	131	155	36%
Total	1,400	1,800	2,200	2,600	3,000	3,400	19%

State sources estimate that the average annual turnover rate for wastewater treatment plant operators is between twenty and twenty-five percent. The highest rate is for Class I operators, as salaries are very low at

package plants and small municipal plants. Sources indicate that salaries are beginning to rise, and more persons are indicating interest in entering the field.

D. Training and Certification

The Training subprogram of the Division of Water Quality has developed a four-day intensive orientation for new employees which orients participants regarding policies, rules and procedures. Some levels of employees spend three days in the field following this orientation. Subsequently, new employees spend approximately six weeks under the supervision of a senior staff person. The initial orientation is held once a month, and an employee orientation handbook is currently being developed.

For technical upgrade training, the Division has relied upon EPA courses offered out of the training center in Cincinnati, Ohio. However, tuition rates have been imposed which lowers the number of State personnel that are able to attend. In addition, the Division feels that courses are needed for its personnel that are not available through EPA. For these reasons, Division administrators hope to develop a technical upgrade training program for personnel that will ensure that personnel receive the types of training required within the Division. In order to develop such a program, a new person will have to be added to the training component, or the scope of the operator training program will have to be reduced.

The Division of Water Quality takes several approaches toward training of wastewater treatment plant operators at the present time. An annual school with classes for all four levels of operators is held in Lexington,

with an average attendance of 200. An average of eight four-day courses are held each year for class II, III and IV operators, at eight locations distributed throughout the State. Finally, 25 to 30 one-day classes are held annually for class I operators, at eight locations. Approximately 400 persons per year are presently receiving training, and this number is expected to remain stable. The Division offers examinations after every course, and persons may take examinations at any time in the headquarters office. The Division is also responsible for issuing licenses.

Training has been chiefly geared toward biological treatment methods rather than physical and chemical methods. As State training officers are attempting to obtain more certified operators of industrial facilities, training will be revised to include physical and chemical treatment methods, which are often performed in the industrial sector. Additionally, although laboratory technicians have shown high attendance at the classroom training sessions, State personnel are not satisfied with this approach, and feel that these technicians should be trained while using their own equipment. For this reason, on-the-job training will in the future be offered to laboratory technicians if State personnel demands will allow. Possibly three or four technicians from neighboring plants will be able to meet at a single plant to receive this type of training. State sources further express a desire to carry out on-the-job training, to be coupled with problem-specific classroom training for plant operators. Needs for this type of training are expected to become more acute as the complexity of plant operations increases. The magnitude of on-the-job training to be offered in the future is contingent upon funding levels and the State training staff level.

In addition to the above specified program modifications, administrators plan to carry out a greater degree of evaluation and follow-up of existing programs. Other modifications will, to a certain degree, be contingent upon the outcomes of these evaluations.

The University of Kentucky has conducted a four-day school for Class I operators through a federal grant. Additional courses will be offered if monies again become available. Administrators in the Division of Water Quality expect that the Division's operator training program coupled with courses made available by the University, will be adequate for providing the operator training required to meet future entry level and upgrade demands.

E. Career Potential

Workforce growth is expected to occur in the Division of Water Quality during the next five years, with chief demands being for scientists and engineers. The Federal Toxic Substances Control Act will not cause a need for additional personnel, but increased focus will be placed on biology and chemistry, partially shifting away from engineering. Persons with strong technical backgrounds and the ability to review permits, and review and write plans will be required to an increasing degree in the Division. Environmental associate degree programs are not available in the state, but persons from these types of programs would be utilized if available.

The number of certified wastewater treatment plant operators is expected to demonstrate considerable growth during the next five-year period. A general upgrading of skills is expected, and persons with backgrounds ranging from high school educations to technical college degrees will be

required, due to the varying complexity of plants. In order to comply with the mandatory certification law, all will have to have the training required to pass certification examinations.

F. Conclusion

Staff increases in the Division of Water Quality are expected for increased activity in river basin management, expansion of monitoring activities and the development of a staff technical training program. Additionally, the acceptance of NPDES permitting authority would cause increased personnel demands.

The Division enforces a mandatory certification law for wastewater treatment plant operators, in which all operators must be certified, but only those in charge must be certified at the level of the plant. Training to operators is carried out by the Division, which now is of a formal classroom nature, but may be expanded to include on-the-job training.

An addition of 400 certified operators per year is expected, due to enforcement efforts and the expansion and upgrading of facilities. A general upgrading of skills is expected, and State sources indicate that training needs can be met through existing and planned State programs if increased personnel and monetary needs can be met.

VIII. ENERGY

A. Introduction

Ninety-five percent of Kentucky's electricity is supplied through coal, which is mined in the State. Also used to supply Kentucky's energy needs are natural gas and oil, and propane, which is used chiefly in agricultural areas. Other contributors to the State's energy supply include hydroelectric and nuclear power.

Kentucky is a leader in the production of coal. Thick seams and gently rolling topography in Western Kentucky permit surface mining, while seams are thinner and slopes are steeper in eastern Kentucky, where most coal mining is carried out underground. Coal mining continues to cause environmental problems. Water pollution is caused by the removal of over-burden, the flow of surface water through mine dumps (acid mine drainage), and the cutting of roads through mountainous terrain. Coal mining activities tend to impair the quality of air in the vicinity of mines. These problems focus on burning dumps and coal dust emanating from mining and hauling operations. Burning coal may create major air pollution problems in those areas where it is used as fuel.

Research and development efforts are taking place in the State for developing cleaner and more efficient ways of burning coal. These are being conducted and funded by such sources as the State Government, State Universities, the Tennessee Valley Authority, the Energy Research and Development Administration and private utilities. Specific projects have studied coal liquifaction and gasification, solvent refining and fluidized bed combustion. The University of Kentucky's Institute for Mines, Minerals and Research has been a leader in energy research, and has recently constructed an energy research center.

The Kentucky Department of Energy was established by Executive Order 75-729 in 1975, to carry out the following purposes:

1) To prepare and maintain a continuous inventory of energy requirements and available supplies and capacities,

2) To formulate an energy management program for the State,

3) To formulate a contingency plan to cope with energy shortages;

4) To administer programs related to curtailment, allocation, conservation, planning, and management of all forms of energy;

5) To encourage wise development of all forms of energy;

6) To develop a process for the regulation of energy facilities siting;

7) To recommend research and development projects which contribute to the adequacy of Kentucky's energy resources;

8) To review State building codes and recommend changes to achieve conservation of energy;

9) To review utility rates and other regulatory practices for their impact on energy consumption;

A Kentucky Energy Resources Advisory Commission was established by the same executive order to advise the Commissioner of Energy and the Secretary of Development on all phases of the Kentucky energy program. This Commission is composed of the following members:

Chairman and Secretary, Development Cabinet
Commissioner, Department of Mines and Minerals
Secretary, Department of Transportation
Secretary, Department of Natural Resources
and Environmental Protection
Chairman, Public Service Commission
Commissioner of Energy

These two energy agencies have no direct roles relating to pollution control and abatement. The Kentucky Department for Natural Resources and Environmental Protection regulates pollution stemming from energy-related activities.

B. Workforce Profile

There are twenty staff persons with the Kentucky Department of Energy. These persons include geologists, political scientists, engineers, and other persons with varying degrees of experience in the field of energy. In addition to the duties assigned to the Department by executive order, the Department will coordinate an energy conservation program under the provisions of the Federal Energy Policy and Conservation Act (EPCA). The goal of this program, as prescribed by the Act, is a reduction of five percent or more in the total amount of energy consumed in the State by 1980 from the projected energy consumption for that year. All States participating in this program are to develop energy conservation plans that include:

1) Mandatory lighting efficiency standards for public buildings (except buildings owned or leased by the United States);

2) Programs to promote the availability and use of carpools, vanpools, and public transportation (except that no federal funds will be used to subsidize public transportation);

3) Mandatory standards and policies relating to energy efficiency to govern the procurement practices of such state and its subdivisions;

4) Mandatory thermal efficiency standards and insulation requirements for new and renovated buildings (except buildings owned or leased by the United States); and

5) A traffic law or regulation which, to the maximum extent practicable consistent with safety, permits the operator of a motor vehicle to turn such vehicle right at a red light after stopping.

All of these programs will be assigned to and implemented by State agencies. The State Fire Marshal's office will enforce the lighting efficiency standards, carpool and public transportation programs will be implemented by the State Department of Transportation, and government procurement practices

will be regulated by the Division of Purchases of the Executive Department for Finances and Administration. Residential thermal efficiency standards will be regulated by Cooperative Extension Service, while those standards for industries will be enforced by the Department of Energy.

A major portion of Kentucky's energy-related workforce is located within the coal mining industry. In early 1974, the Kentucky Development Cabinet engaged Spindletop Research, Inc., to analyze the coal workforce situation in Kentucky and neighboring states. The results were published in a report, Kentucky's Coal Manpower: An Assessment of Needs and Availability for Increased Coal Production, June, 1974. The study was subsequently updated, replacing the original report. This updated study, entitled Kentucky's Coal Manpower: An Updated Assessment of Needs and Availability for Increased Coal Production through 1985, December, 1974, estimated that 30,561 persons in Kentucky worked in coal mines during 1974: 20,159 in underground operations and 10,402 in surface mining operations. Estimates for 1976 included 20,793 in underground mines and 11,023 in surface operations.

According to sources in the field, land reclamation is the environmental effort that requires the greatest workforce requirements. The Spindletop report states that reclamation is normally done by production personnel with supervision by the same individuals who are responsible for the coal mining. Recent advances in reclamation technology have led to the development of reclamation specialists at the professional level. However, little special training is required for subprofessional reclamation personnel beyond instruction regarding the proper methods of equipment operation. Kentucky has a mandatory land reclamation law for strip-mined land.

Field research suggests that the majority of mining operations utilize on-staff professionals, such as geologists, civil engineers and mining engineers

for air and water pollution control functions, although private consulting firms may be employed irregularly to deal with specific problems or to install equipment. Because of strict air pollution laws, utilities are demanding low sulfur coal. This has required that crew persons be responsible for the collection of samples and their delivery to laboratories for the analysis of sulfur content. This responsibility has required that mining operations have available the expertise of chemical engineers, to supervise the blending of coals to achieve specified sulfur contents. The number of laboratories has increased dramatically in the past several years because of air pollution control laws. Usually required by laboratories are chemical engineers. In addition, coal washing plants are being used more frequently. They require the operations skills of highly trained chemists and chemical engineers, semi-skilled personnel for maintenance and an increased number of truck drivers.

As previously stated, agencies, institutions, and private enterprise in the State are investing money and effort in research and development programs to achieve advanced methods of coal utilization that would decrease the air pollution problems associated with the use of coal for the creation of electricity.

C. Workforce Projections

The Commissioner of the Kentucky Department of Energy does not expect a need for dramatic workforce growth within the Department during the next five years. The number of positions may increase from 20 to 28 during this time frame. These positions will be similar to those now on staff. Increased numbers of personnel will become involved in energy conservation programs in those agencies designated to participate in the EPCA program. Highly skilled

engineers, architects and scientists may be required in the private sector for meeting the demands of EPCA.

Mining requirements related to land reclamation and air and water pollution control are not expected by sources in the public or private sector to decrease, and may actually increase as State and federal laws and regulations become more stringent. The Spindletop report forecasts that the increasing production in surface mining will create additional demands for personnel in reclamation technology. The demand for professional personnel will increase, and substantial numbers of people will be needed both at the mines and as State reclamation inspectors. Sources in the private sector suggest that the second greatest workforce demand relating to environmental control will be for the continuing demand to produce low sulfur coal. Within the next five years, emphasis will probably be placed on the analysis, mixing and washing of coal to meet sulfur content requirements. As the new technologies become available, such as coal gasification and liquifaction, become available, efforts will shift, and demands should be chiefly for highly skilled scientists and engineers to perform the required operations.

The projected growth rate for those involved in mining operations should closely follow the total mining workforce projections for the State. In the previously-cited report, Spindletop Research, Inc., developed such projections, chiefly based upon predicted coal production. The following table has been extracted from this report, and summarizes the projected workforce needs through 1985.

TABLE XX

Employment in Kentucky Coal Mines 1973-1985

	Eastern Kentucky		Western Kentucky		
Year	Underground	Surface	Underground	Surface	Total
1973	15,111	7,242	5,048	3,160	30,561
1974	15,740	7,598	4,838	3,074	31,250
1975	15,882	7,764	4,742	3,051	31,439
1976	16,151	7,999	4,642	3,024	31,816
1977	16,399	8,235	4,534	2,997	32,165
1978	16,775	8,551	4,840	2,966	33,132
1979	17,120	8,871	5,171	2,913	34,075
1980	17,430	9,192	5,036	3,188	34,846
1981	17,704	9,518	5,369	3,221	35,812
1982	17,927	9,842	5,482	3,422	35,673
1983	18,097	10,167	5,622	3,612	37,498
1984	18,201	10,487	5,719	3,818	38,225
1985	18,230	10,802	5,807	4,023	38,862

Source: Spindletop Research, Inc.

According to the previous table, an approximate 2% growth rate for all mining occupations is expected to occur. The percentages of total growth by occupational category for 1976 and 1982 are reflected in the following table which was adapted from the Spindletop report:

TABLE XXI

Projected Additions to Kentucky's Coal Mine Workforce for 1976 and 1982, by Occupation

	1976		1982	
Position	No.	% of Total	No.	% of Total
Underground				
Operator	598	44%	793	40%
Repairman	79	6%	105	5%
Foreman	110	8%	147	7%
Mining Geologist	7	.5%	15	1%
Mining Engineer	7	.5%	15	1%

Surface				
Operator	426	32%	719	36%
Repairman	54	4%	90	4%
Foreman	54	4%	90	4%
Field Geologist	6	.5%	16	1%
Civil Engineer	6	.5%	16	1%
Total	1,347	100%	2,006	100%

This table suggests that surface mining activities will increase at a higher rate than will underground mining activities, and thus the resultant environmental activities involved with strip mining should increase at a similar rate. It should be noted that for both underground and surface activities, the need for professionals, i.e., mining geologists, mining engineers, field geologists and civil engineers should more than double within this time frame.

D. Training and Certification

Kentucky's energy-related training opportunities are concentrated in the area of coal mining. The Spindletop 1974 report surveyed available educational/training programs in the field, which are depicted in the following table:

TABLE XXII

Educational/Training Opportunities in Kentucky for Coal Mine Workers (1974)

Schools	Task Levels
University of Kentucky	Geologists and Mine engineers, health, safety
Moorehead State University	Foreman
Pikeville College	Foreman, health & safety electricity for on-the-job, water quality control, and reclamation beginning in 1975
Madisonville Community College	Foreman, health & safety, reclamation & surveyors

Southeast Community College	Foreman
Harlan Area Vocational School	Foreman (upgrading), maintenance
Hazard Area Vocational School	Maintenance, heavy equipment operators
Mayo Area Vocational School	Foreman, maintenance
Madisonville Area Vocational School	Foreman, maintenance, equipment operation (surface & underground heavy equipment operating program just initiated)
Bell County Vocational School (proposed)	Underground mining equipment operators
Coal Companies	a)Upper and middle management: Management Programs: seminars & paid schooling b)Foreman: In-house programs, cooperation with school programs c)Health and safety: inhouse use of multimedia presentations,cooperate with school programs, liaison with state & federal trainees d)Reclamation: cooperation with State Reclamation Association, cooperate with school programs e)Maintenance & equipment operators: on-the-job training, cooperate with school programs f)Laborers: orientation programs

As a part of the State's energy conservation program, the Department of Energy will implement a public awareness program on principles and methods of energy conservation. Efforts will be directed both toward residential unit owners, and industry and commerce. Special seminars will be held during a planned annual energy awareness week.

E. Career Potential

Limited opportunities may occur in the Department of Energy for engineers geologists, political scientists and other persons with experience in the field of energy. Increased requirements may also occur in other units of the

State Government due to the implementation of the EPCA program. Demands in the private sector are expected to increase for such skilled professionals as engineers, scientists and architects to assist in meeting the EPCA requirements.

Research indicates an increasing need for all levels of personnel associated with underground and surface mining. For environmental concerns, professionals with knowledge in the field of land reclamation will be in increased demand as the amount of strip mining increases. Persons with expertise and skills relating to control of air and water pollution will also be required in increasing numbers. Typically these matters are dealt with by engineers and geologists on staff. Chemical engineers and chemists should be in increasing demand during the next five years in coal mining operations and in private laboratories to sample, mix and analyze coal for meeting sulfur content limitations.

F. Conclusion

The Kentucky Department of Energy, in cooperation with other State agencies, will implement an energy conservation plan under the provisions of the Federal Energy Policy and Conservation Act. Workforce requirements for professionals in fields related to energy conservation should increase in both the private and the public sectors.

The largest energy-related workforce in Kentucky is in the area of coal mining. This activity has a large potential for creating air, water and land environmental problems. To meet State and federal environmental requirements, mining operations must have available persons with expertise and skills in the areas of land reclamation, and air and water pollution control. Because of strict air pollution requirements, coal-burning utilities are placing limitations on the sulfur content of coal, which requires coal mining operations

to perform the analysis, mixing, and sometimes washing of coal. Because of the anticipated expansion of mining activities in the State, requirements for all levels of personnel engaged in environmental control activities are expected to increase.

Universities, colleges and two-year institutions in the State are offering curricula in many facets of mining, including environmental areas. Because of greatly increasing workforce demands, companies are not funding the numbers of trained persons required, and often resort to in-house training. Sources in the field indicate that an expansion of institutional programs could be justified by the workforce demands, that are expected to emerge over the next five to ten year period. Professionals can usually gain the required expertise through traditional science and engineering programs and the greatest needs seem to be for expansions of two-year curricula.

Selected Post Secondary Institutions With Formal Environmental Energy Programs

On the following pages two environmental curricula, including information concerning coursework, current student participation, and graduate placement, are presented. The first outlined program represents Georgetown College in Georgetown; the second represents Western Kentucky University in Bowling Green. Both institutions offer B.S. degrees in Environmental Science which are designed to prepare graduates for immediate career opportunities in environmental services. Western Kentucky augments its curriculum with career opportunities in Environmental Engineering Technology, also a B.S. degree.

Elsewhere in the state, environmental curricula exist in numerous forms. The University of Louisville offers B.S. and M.S. degrees in both Environmental and Civil Engineering. The former program consists of an intensive study of relevant environmental problems such as air, water, and noise pollution, and disposal of solid, water, and radioactive wastes.

The University of Kentucky in Lexington offers a B.S., M.S. and Ph.D. in Civil Engineering. The College of Engineering also offers an M.S. degree in Nuclear Engineering.

At Morehead State University in Morehead, the Center for Environmental Studies offers a major with four options: 1) Ecology 2) Geology, 3) Social Sciences and Economics, and 4) Chemistry and Physics. Students may also minor in Environmental Studies to supplement other majors. Students majoring in Environmental Studies are required to structure their programs around a subject core, then complement it with a variety of biology, chemistry, physics, geoscience and social science courses.

The College of Arts and Sciences at Eastern Kentucky University in Richmond provides a Major in Environmental Resources while the College of Education offers a B.S. program in Public Health with an Emphasis in Environmental Health.

Each of these educational programs listed above was described or explained by professionals at the institutions or through published bulletins and catalogs.

SENIOR INSTITUTIONS

Georgetown College
Georgetown, Kentucky

Program: Environmental Sciences (B.S.)

Hours required for major: Semester - 62 plus prerequisites
Program Inception: 1971
Staff Size: Interdisciplinary department with support from about 40 professors.
Enrollment: 20
Graduates (1976): 4
Placement: 3
Graduate Work: 0

Courses

Biological Principles
Environmental Biology
General Ecology
General Chemistry
Physics
General Geology
Environmental Science Seminar

Electives from the following:
General Chemistry II
Organic Chemistry
Advanced Analytical Techniques
General Physics II
Thermodynamics
Physics - Seminar
Calculus I
Microbiology
Computer Programming
Statistics
Modern Physics
Animal Diversity
Plant Diversity
Microbiology
Spring Flora and Plant Taxonomy
Dendrology
Entomology
Freshwater Biology
General Chemistry
Organic Chemistry
Advanced Analytical Techniques
Animal Diversity II
Plant Diversity II

Microbiology II
Spring Flora and Plant Taxonomy II
Dendrology II
Principles of Sociology
Population Problems
American Government
Urban Government
Physical Geography
Cultural Geography

SENIOR INSTITUTIONS

Western Kentucky University
Bowling Green, Kentucky

Program: Environmental Science (B.S.)

Hours required for major: Semester - Major 132-133
Program Inception: 1970
Staff Size: One professor, seven associate professors, one assistant professor (2 Ph.D.'s, 7 M.S.)
Enrollment: 40
Graduates (1976): 4
Placement: 4
Graduate Work: 0

Courses

Introduction to Engineering Technology
Introduction to Environmental Science
Air Pollution Control
Water Supply
Water Supply Laboratory
Waste Water Treatment
Radiological Health
Industrial Hygiene
Industrial Waste Treatment
Solid Waste Treatment
Sanitation
Environmental Impact Statements

Program: Environmental Engineering Technology (B.S.)

Hours required for major: Semester - Major 129-131
Program Inception: 1970
Staff Size: One professor, seven associate professors, one assistant professor (2 Ph.D.'s, 7 M.S.)
Enrollment: 45
Graduates (1976): 5
Placement: 2
Graduate Work (M.S.): 3

Courses

Introduction to Engineering Technology
Statics
Plane Surveying
Strength of Materials

Soil Mechanics
Introduction to Environment Studies
General Hydrology
Fluid Mechanics
Fluid Mechanics Laboratory
Air Pollution Control
Water Supply
Water Supply Laboratory
Waste Water Treatment
Radiological Health
Industrial Hygiene
Industrial Waste Treatment
Solid Waste Treatment
Sanitation
Environmental Impact Statements

State Legislation

TITLE:

Environmental Protection Law
Kentucky Statutes 224

PURPOSE:

To create a department for natural resources and environmental protection; to provide for the control of water, noise, solid waste and air pollution; to conserve the resources of the state, and protect the general environment of the state.

DEFINITIONS:

1. Air contaminant
2. Air contaminant source
3. Air pollution
4. Cesspool
5. Commission
6. Secretary
7. Department
8. District
9. Effluent limitations
10. Environmental noise
11. Noise
12. Person
13. Product
14. Publically owned treatment works
15. Schedule of compliance
16. Seepage pit
17. Septic tank
18. Sewage system
19. Solid waste
20. Solid waste disposal site or facility
21. Tank
22. Ultimate purchaser
23. Water pollution
24. Water

ADMINISTERING AUTHORITY:

Department for Natural Resources and Environmental Protection

AUTHORIZATIONS:

To develop a comprehensive environmental plan;
To encourage effective land use;
To develop a management program of water, land and air resources;
To prevent and control water, land, noise and air pollution;

AUTHORIZATIONS (Cont'd):

To control stripmining;
To enter and inspect property in enforcement of the act;
To monitor the environment and propose control systems;
To issue regulations pursuant to the act;
To issue permits as needed for water, air and noise pollution and solid waste control;
To undertake investigations and hold hearings;
To act as the state lead agency in water, air and solid waste matters;
To advise on noise control matters.

CERTIFICATION OR LICENSING:

Licensing of all persons servicing septic tanks, seepage pits or cesspools is required;
Sewage system operators must be certified by examination according to classification of facility;
Products must be certified according to noise standards;
Permit needed for solid waste sites.

PROHIBITED ACTS:

To discharge as to cause water pollution;
To emit unreasonable levels of noise;
To dispose of solid waste other than at a proper facility;
To allow or cause emissions contribution to air pollution;
To violate any licensing or certification provisions of the act.

EXEMPTIONS:

Plumbers and home owners on own property from septic tank rules;
Department has authority to exempt totally or partially water discharges;
Households exempt from solid waste rules.

PENALTIES:

Fines of up to $5,000;
Willful violations - fines of from $1,000 to $10,000 or one year imprisonment;
Noise violations - fines of from $100 to $1,000;
Civil penalties imposed including amounts to restore and replenish damaged fish and wildlife.

KENTUCKY PESTICIDES

TITLE:

Pesticide Use and Application Act
Kentucky Statutes 217B

PURPOSE:

To provide for the control of pesticide use and the certification of pesticide applicators.

DEFINITIONS:

1. Defoliant
2. Department
3. Desiccant
4. Distribute
5. Engage in business
6. EPA
7. Equipment
8. Fungi
9. Insect
10. Label
11. Land
12. Nematode
13. Person
14. Pest
15. Pest control consultant
16. Pesticide
17. Pesticide applicator
18. Pesticide operator
19. Plant regulator
20. Public operator
21. Restricted use pesticide
22. Restricted use pesticide dealer
23. Snails or slugs
24. Spray adjuvant
25. Weed
26. Wildlife

ADMINISTERING AUTHORITY:

Department for Natural Resources and Environmental Protection

AUTHORIZATIONS:

To issue regulations pursuant to the act regarding pest and pesticide categories;
To certify applicators and develop classifications of applicators;
To regulate storage, transportation and use of pesticides;
To enter and inspect property and make investigations.

CERTIFICATION OR LICENSING:

All applicators of restricted pesticides must demonstrate competence and be certified; ten categories of applicators established; Dealers must be licensed.

PROHIBITED ACTS:

To apply pesticides commercially, or act as pest control consultant or operator, without proper license;
To store or dispose of pesticides or containers in manner harmful to environment.

EXEMPTIONS:

State agencies, structural pest operators; use of non-restricted pesticides on own property.

PENALTIES:

Civil - fines of up to $1,000;
Criminal - fines of from $100 to $1,000 or one year imprisonment.

KENTUCKY SOLID WASTE

TITLE:

Garbage and Refuse Disposal Law
Kentucky Statutes 109

PURPOSE:

To provide for a local coordinated program of refuse collection and disposal.

DEFINITIONS:

1. Garbage
2. Refuse
3. Disposal method
4. Collection system
5. Person
6. Department
7. Board of Directors

ADMINISTERING AUTHORITY:

State Health Department
Local Agencies

AUTHORIZATIONS:

To contract and form joint arrangements for the collection and disposal of garbage and refuse;
To create garbage disposal districts;
To approve and issue permits for local methods of collection and disposal;
To issue regulations pursuant to the act.

KENTUCKY ENERGY

TITLE:

Department of Energy Law
Kentucky Statutes 152A-010

PURPOSE:

To create a department of energy and provide for management of and planning state energy needs and resources.

DEFINITIONS:

ADMINISTERING AUTHORITY:

Department of Energy
Center for Energy Research

AUTHORIZATIONS:

To develop a comprehensive energy program for the state;
To administer energy allocation and conservation plans;
To coordinate state energy development;
To review and recommend on state energy utilization and efficiency matters;
To study energy and tax law implications;
To act as the state lead agency on energy matters;
To administer and conduct long-range energy research projects.